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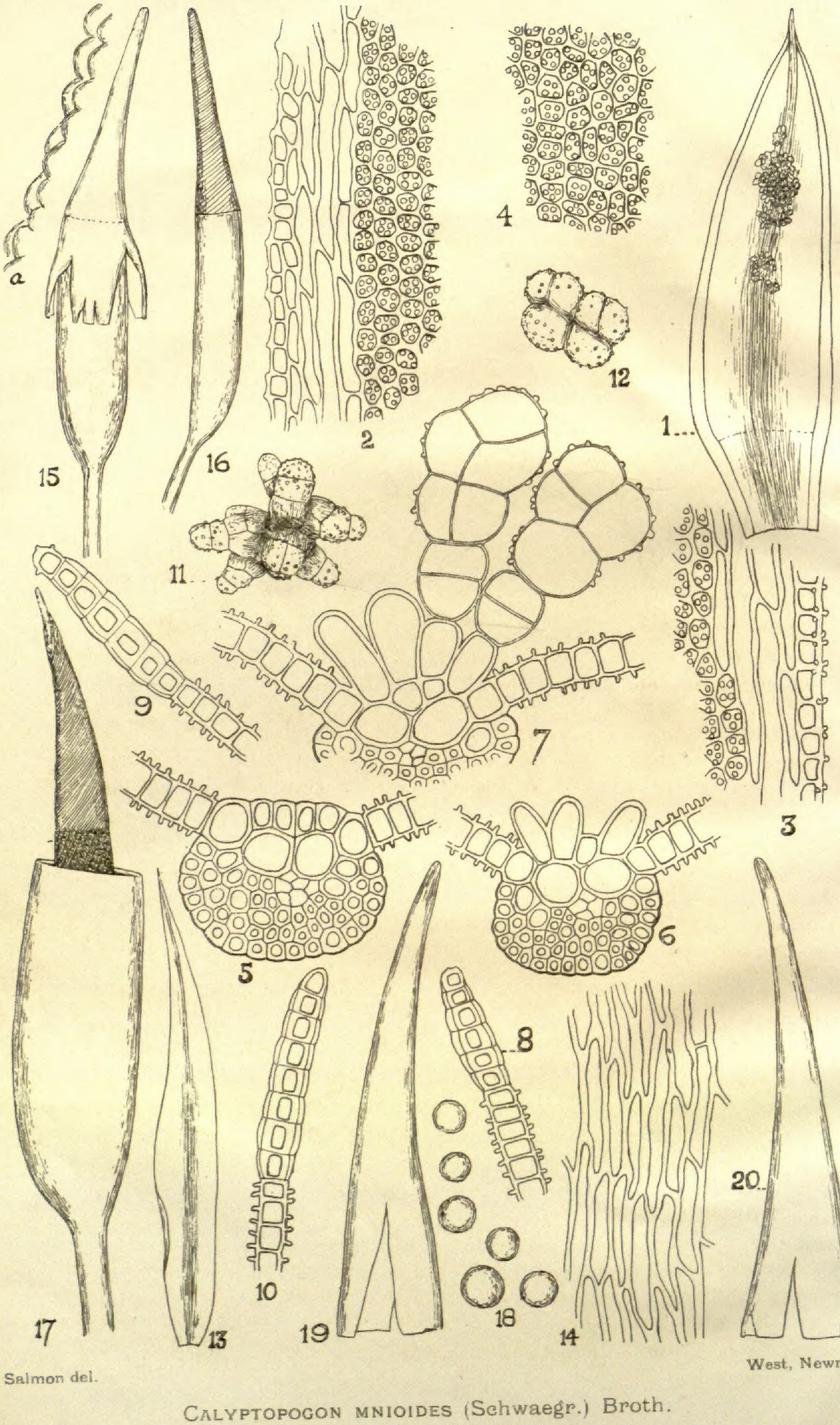

E. S. Salmon del. West, Newman proc.

CALYPTOPOGON MNIOIDES (Schwaegr.) Broth.

THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN.

BRYOLOGICAL NOTES.

By Ernest S. Salmon, F.L.S.

(Continued from Journ. Bot. 1902, p. 374.)

(Plate 445.)

(30). Calyptopogon mnioides (Schwaegr.) Broth.

In 1842 Schwaegrichen (Sp. Musc. Frond. Suppl. iv. tab. ccexh (1842)) published a moss under the name *Barbula mnioides* The leading characters given in the diagnosis were the following:—"Folia *Mnii*, erecta, oblonga vel ovato-oblonga, marginata, tenerrime crenata, siccitate plicata et margine crispa. Folia calycis fructiferi circiter sex, exteriora tria pedunculo longiora, e lanceolata longissime acuminata, integerrima, marginata, madore et siccitate erecta, convoluta. Calyptra capsula paullum brevior, subulata, latere fissa . . . *Plantula* inter *Barbulas* elegantissima, caule et foliis *Mnio*, peristomio *Barbulis* similis, habitu inprimis *Tortulæ leucocalyci* Montagnei. Habitat in Chile." A very fine plate of the species is given, in which the crisped and twisted stem-leaves, and the very long erect convolute perichætial leaves, reaching up to or beyond the base of the capsule, are well represented.

Notwithstanding Schwaegrichen's clear description and excellent plate, much confusion has settled round his species.

In 1849 Müller (Syn. Musc. Frond. i. 632) described under the name "*Barbula mnioides* Schwaegr., tab. 310," a very different plant, as the following characters given here by Müller would lead us to expect:—"Folia recurvo-patula, margine revoluta, apice juniorum plus minus argute hyaline et tenuiter dentata, theca cylindrico-elliptica curvula." In Müller's diagnosis the most important and characteristic features of Schwaegrichen's plant are omitted, *viz.* the crisped and twisted leaves, and the sharply marked-off, convolute perichætial leaves. Müller, in fact, was describing as *B. mnioides* a totally distinct plant, viz. *B. prostrata* Mont. I have already referred to the confusion here created in a previous note (Journ. Bot. xxxix. p. 357 (1901)), where I pointed out that the moss referred to *B. mnioides* Schwaegr., both in Hampe's and Bescherelle's herbaria, was really the widely different *B.*

prostrata Mont. I have lately had the opportunity of examining the specimen of "*B. mnioides*" in Müller's own herbarium, and also of seeing the type of *B. mnioides* in Schwaegrichen's herbarium. Müller's specimens are labelled "*Barbula mnioides* Schw. Chile, Corral, an Apfelbäume, raro. Krause legt. Dr. Lorentz, 1866. *Streptopogon mnioides* Mitt. in Proc. Linn. Soc. 1860, p. 72 *immerito!*" The plant here is *B. prostrata*, a species which does not bear the slightest resemblance to the true *B. mnioides*, as Schwægrichen's type-specimens show. *B. prostrata* possesses rigid leaves, not at all crisped in the dry state, and perichætial leaves not conspicuously different from the cauline. We may note here that, as Müller has thus misinterpreted Schwaegrichen's species, his remarks on its affinity (Gen. Musc. Frond. p. 455) become irrelevant.

Further, we find that Müller, having misapplied Schwaegrichen's name in his *Synopsis*, has described later the true *B. mnioides* as a new species under the name *B.* (*Syntrichia*) *crispatula*, in *Hedwigia*, xxxvi. p. 104 (1897). Here we find a plant described as possessing leaves "laxe patula crispata, limbo ad basin folii lato apicem versus angustiore ad apicem folii extremum evanido ubique flavido-pallescente distinctissime marginata." I have examined the type-specimens in Müller's herbarium. They are labelled "*Syntrichia crispatula* n. sp. Patagonia, inter 50°–53°, cum *Ulota gymnomitria* n. sp. F. P. Moreno, 1884." The plant, which in these specimens is barren, agrees perfectly in habit, shape, and areolation of leaf, &c., with the type-specimens of *B. mnioides* from Chili. Further, there is in Müller's herbarium another example of the same moss, on the label of which has been written by Dusén "*Platylomidium crispatula* C. M. Patagonia occ. Rio Aysun, in ramulis. Dusén. 1897"; and by Müller, "*Syntrichia crispatula* C. M." This example is much more robust than the type-specimen above referred to, and (in the specimen sent to me) bears one capsule and also a separate perichætium. In all its fruiting characters, and in the erect sheathing perichætial leaves, Dusén's plant shows exact agreement with Schwaegrichen's *B. mnioides*. The specimens are, however, somewhat remarkable for their bright yellowish-green colour, and for their robust habit; the latter characteristic making them specially interesting, for a reason which will be mentioned later.

In the Kew Herbarium also there are beautiful examples of "*S. crispatula*," lately received from Dusén, labelled "nr. 792, Patagonia occ. in valle fluminis Aysen in ramulis. Feb. 1897." These specimens, which bear young and ripe fruit, agree perfectly with Schwaegrichen's type of *B. mnioides*; and differ from the specimen of Dusén's in Müller's herbarium only in being less robust and in the duller colour.

Attention must here be drawn to two points in which Müller's description of *B. crispatula* is incorrect. Müller observes of his species: "*Barbulæ crispatæ* Hpe. simillima atque proxima, sed areolatione minore nec angulato-punctata pro primo visu recedens." I have compared the type-specimens of Hampe's *B. crispata* with Müller's plant, and can state that the size of the leaf-cells is exactly the same in both; further, as fig. 4, drawn from Müller's type,

shows, the areolation of *B. crispatula* is "*angulato-punctata*," caused by the thickening of the wall at the angles of the cells, in exactly the same manner as in *B. mnioides*. Müller also, in his diagnosis, describes the margin of the leaf as "*integerrimus*," whereas in reality this is distinctly crenulate-papillose, just as in *B. mnioides*. *S. crispatula* must therefore be sunk in *B. mnioides*, and the distribution of the species can be extended to Patagonia.

The fact may be noted here that in Schwaegrichen's diagnosis of his species the stem-leaves are described as "*erecta*," whilst Mitten says of *B. mnioides* (under *Streptopogon*), in *Musci Austro-americani*, p. 179, "*Folia inferne erectiora, superne patentia*"; and in Müller's description of *S. crispatula* the leaves are called "*laxe patula*." As a matter of fact, the stem-leaves of the present species are somewhat variable in direction; on some stems, as, *e.g.*, on those examined in Schwaegrichen's type, the leaves are patent or patulous, or, towards the apex of the stems, erecto-patent; in the stems of "*S. crispatula*" examined, also, the leaves vary in direction from patulous to erecto-patent.

In Schimper's herbarium at Kew there are three specimens referred to the present species. One of these is labelled in Schimper's handwriting "*B. mnioides* Mtge. Peruvia, Carabaya. July, /47. Weddell, nr. 17." This moss, however, is *Streptopogon erythrodontus* (Tayl.) Wils., a species which bears a slight superficial resemblance to *B. mnioides*. The two other specimens are correctly named, and are labelled "*Tortula mnioides* Montg. Fl. Chiles. *Barbula* Schwaegr. Chili. Hb. Montagne"; and "*Barbula mnioides* Schw. Valdivia, Arrique. Lechler l. nr. 654, July /51." Both are good fruiting examples of the species, and agree in every way with Schwaegrichen's type.

I have also seen in Mitten's herbarium the specimen from "Quito, leg. Jameson," which, in *Musci Austro-americani*, is referred to *B. mnioides*. This specimen, which is without doubt correctly determined, consists of a single barren stem. This record is of interest as being the most northern locality up to the present known for the species in South America.

In 1855, Wilson, in enumerating the mosses in Hooker's *Flora of New Zealand*, vol. ii. p. 71, recorded a moss under the name "*Tortula mnioides*? Schwaegr. Northern Island, Colenso," and remarked, "Specimens few and barren, referred with doubt to *T. mnioides*, which we have not seen." In 1860, Wilson again, in the *Flora Tasmaniæ*, vol. ii. p. 176, referred to the same plant as occurring in Tasmania, remarking here, "It appears to be identical with Schwaegrichen's moss." In the *Flora Tasmaniæ*, ii. p. 376, Mitten identified the same Tasmanian moss as Schwaegrichen's species, calling it "*Streptopogon mnioides*." Also, Mitten, in his "Mosses of New Zealand, Tasmania, &c.," in Journ. Linn. Soc. iv. 72, enumerated the same moss, quoting it as "*S. mnioides* Mitt. (*Barbula*, Schw.)."

In 1876 we find that Hampe published in *Linnæa*, xl. p. 304, a moss from Australia as a new species under the name *Barbula crispata*. Hampe remarked of his plant, which was sterile but

possessed perichætia, "*B. mnioidei* proxima, foliis patenti crispatis, limbo apice folii evanescente, perichætialibus immarginatis diversa." The habitat given of the plant was "in monte Macedon ad ramos, pauca frustula."

Now, this Australian moss is the same plant as that referred by Wilson and Mitten to *B. mnioides*, and after examining a considerable amount of material I have come to the conclusion that the Australian, New Zealand, and Tasmanian plant does not differ in any way from *B. mnioides*.

First, as to the alleged points of difference mentioned above by Hampe. As pointed out above, the leaves of *B. mnioides* are always crisped, and, although described by Schwaegrichen as "erect," are really, as can be seen in the type-specimens, frequently patent or even patulous. The limb of the leaf of *B. mnioides*, although often reaching to the apex of the leaf, and becoming there confluent with the excurrent nerve, frequently in other cases—as may be seen, *e.g.*, in the type-specimens themselves—ceases just before the apex is reached. Müller, it may be here noted, described the limb of the leaf of "*S. crispatula*" as "ad apicem folii extremum evanido." Lastly, the perichætial leaves of *B. mnioides*, although described by Schwaegrichen as *marginata*, are nearly always wholly without any limb, and it may be suspected that the word occurs here as a misprint for *immarginata*.

The following description of the perichætial leaves of *B. mnioides* is based on examination of the type-specimens. The true perichætial leaves are 2–3 in number, and are sharply marked off in shape and structure from the cauline leaves, being much longer and narrower, with a very long gradually tapering acumen (see fig. 13); they are somewhat scarious in texture, and are more or less convolute. In the dry state, as well as in the wet, they remain erect, not becoming "crisped" like the cauline leaves. These perichætial leaves are usually wholly immarginate, with all the leaf-cells—except those of the contracted base, which are wide and rectangular—narrow and prosenchymatous, pellucid, smooth, and with rather thick walls (fig. 14). Occasionally, however, one of these long erect convolute perichætial leaves will show in its apical portion some of the characteristics of a cauline leaf, *viz.* the small obscure papillose areolation, and a more or less well-defined "limb." Sometimes, also, the stem-leaves immediately below a perichætium, while retaining the distinct "limb" and the normal dense papillose areolation, become somewhat elongated, narrower, and more gradually acuminate at the apex,—so forming a transition to the perichætial leaves.

Since then the perichætial leaves of *B. mnioides* are, as a rule, quite without any limb, the last of the characters relied upon by Hampe as marking off his *B. crispata* disappears, and the name must be added to the synonymy of the present species.

Nevertheless, the plant which has been passing as *B. crispata* in New Zealand and Tasmania has often a distinct *facies* of its own. This is due to the name having been kept usually for sterile plants of a robust habit. This sterile form, which appears to be common

in some parts of these countries, certainly differs a little from the usual examples of the fertile South American plant. The characteristics of this New Zealand and Tasmanian form are well seen in specimens sent to me by the Rev. W. W. Watts, which are labelled "*Streptopogon mnioides* Wils. = *S. crispata* (Hampe), Hobart Rivulet, Tasmania"; in specimens in the Kew Herbarium from North-west Bay River, Tasmania (legt. Oldfield); in some (not all) of the specimens collected in New Zealand by Colenso; and in specimens in Mitten's herbarium from Pine Hill, Dunedin, New Zealand (legt. W. Bell). All these specimens show, besides the more robust habit, slightly broader leaves, which have a tendency to be less acuminate at the apex. That these features are merely those of a form, and not of a true variety, appears to me to be conclusively shown by the following facts. In some New Zealand examples we find that on the same stem the basal leaves are patent or patulous, and of a broad shape, with acute apex; while higher up the leaves become erecto-patent and narrower, and more acuminate at the apex. Further, with respect to the robust habit, the specimens of "*S. crispatula*" sent by Dusén to Müller (referred to above) are quite as robust as the most pronounced form of "*B. crispata.*" This Patagonian example, indeed, exactly matches in habit and its large wide leaves such typical "*B. crispata*" as that, *e. g.*, from North-west Bay River (Oldfield), and shows that in South America, just as in Australasia, *B. mnioides* sometimes assumes a robust habit. Moreover, in the examples of *B. mnioides* collected in Chili—from Lechler in Mitten's herbarium—the upper leaves on some of the stems are as large and as broad as those of any examples of *B. crispata*. Also, in Lechler's specimens (nr. 654) in the Kew Herbarium, the leaves on different stems *in the same tuft* vary considerably. Some are oblong-lanceolate, subacuminate at the apex, and measure 4 × 1 mm.; others, usually near the base of the stem, are broadly oblong, 3·5 × 1 mm., and are acute, not subacuminate, at the apex. (In the lowermost stem-leaves, it may be noted here, the nerve ceases below the apex, as is often the case with leaves in this position.)

On the other hand, some of Colenso's New Zealand specimens, although sterile, have the slender habit and taller stems, with narrower more erect leaves, of the more usual form of *S. mnioides* in South America. In some of these stems also, it is to be noted, we find in the lower part of the stem broad patulous leaves, acute at the apex, whilst higher up the same stems the leaves are narrower, erecto-patent, and subacuminate at the apex.

Still confining ourselves to the consideration of the *sterile* plant in Australasia, we find that this has received lately a fresh name, having been published in 1897 as a new species by Müller under the name *Barbula* (*Syntrichia*) *Wilhelmii*, in *Hedwigia*, xxxvi. p. 104. No full description of this moss has appeared, Müller (*l. c.*) merely referring to the plant as follows:—"Extra *Barb. crispatam* Australia habet speciem alteram multo robustiorem auream, quæ Victoriam et Tasmaniam habitat, nempe *Barbulam Wilhelmii* n. sp., quam Cl. Wilhelmi ad truncos arborum Victoriæ 1867 et Cl. Wey-

mouth in monte Wellington Tasmaniæ 1891 collegit." I have been able to examine the type-specimen of *B. Wilhelmii*, and am convinced that it is identical with *B. crispata*, i. e. *B. mnioides*. It is a barren moss, and does not differ in colour from the usual New Zealand and Tasmanian forms of *B. crispata*; it is also of exactly the same colour as Schwaegrichen's type-specimens of *B. mnioides*. It is not so robust as many forms of *B. crispata*, and not nearly so robust as the Patagonian examples from Dusén in Müller's herbarium. It is, in fact, in no way separable from *B. mnioides*, and in habit is about intermediate between the slenderer and the robust forms of the species.

B. mnioides has, however, lately been found in fruit in New Zealand. On its discovery it was published as a new species, under the name *Streptopogon Hookeri*, by Mr. Robert Brown (of Christchurch, New Zealand) in Trans. N. Zeal. Instit. xxx. p. 410, pl. xli. fig. 2 (1897). In the diagnosis here given the plant is described as "monœcious. Male inflorescence terminal on separate branches, gemmaceous." The following remarks are made on the plant:—"The New Zealand species, which I have named *S. Hookeri*, is very abundant all over Banks Peninsula, on rocks and trees, but is rarely found in fruit there; but at Moa Creek, Milford Sound, West Coast, &c., it fruits freely, evidently requiring a great deal of moisture. . . . I note that in the New Zealand plant the perichætial leaf sheathes the fruit-stalk to the base of the capsule, which is often subimmersed. This is not given as a characteristic of *S. mnioides*. Also, the former is monœcious, while the latter is described as dicœcious. The two plants are very similar, with the exception of these two points which I have noted; hence I am bound to assume that they cannot be identical."

I have been able, through the kindness of Mr. Robert Brown, to examine a fine series of specimens (now in the Kew Herbarium) of his plant, and after close examination I cannot find that it shows any difference from *B. mnioides*.

Some remarks may be made here on the inflorescence of *B. mnioides*. In Schwaegrichen's diagnosis the species is described as "probably monœcious." In Mitten's later description (Musc. Austr.-Amer. p. 179), however, the species is described as "dioicus. Flos masculus apicalis, gemmiformis, crassus, foliis arcte imbricatis." I have seen no male inflorescence except in the case of Brown's New Zealand specimens, and here the plant certainly appears to me to be dioicous. The male stems are sometimes slightly intermixed with the female, but on being traced to their base are always found, I believe, to belong to different plants; frequently the male plant, consisting of numerous stems bearing thick gemmiform male flowers, forms distinct separate tufts. I give below, in the diagnosis of the species, a detailed description of the male plant.

The inflorescence being the same in the South American and the New Zealand plant, and since also the perichætial leaves of *S. mnioides* do sheathe the seta to the base of the capsule (cfr. Schwaegrichen's figures), or often reach beyond it, all the alleged

distinguishing characters of *S. Hookeri* disappear; so that the name must be treated as a synonym of *S. mnioides*. I am inclined to think, from some of the specimens sent, and from the remark, quoted above, that the moss is common in the sterile state, that Brown's "*S. Hookeri*" was intended by the author to include Hampe's *B. crispata*.

It may be noted that in *S. Hookeri* the perichætial leaves, whilst being often wholly immarginate, frequently show at the apex the small dense papillose areolation characteristic of the cauline leaves, together with a more or less evident "limb."

B. mnioides Schwaegr., therefore, has had—if the above determinations be allowed—a somewhat curious history since its original discovery in Chili in 1842. On being found in Patagonia in 1884 it was described as a new species, *B. crispatula*, by Müller, through that author having described in his *Synopsis*, under the name *B. mnioides*, a very different moss. On the discovery of the present plant in a barren state in New Zealand and Tasmania as far back as 1855 and 1860, Wilson and Mitten recognized it as Schwaegrichen's species, but this fact did not prevent the plant in Australasia from receiving at other hands three fresh names. Hampe, in 1876, called the sterile plant in Australia *Barbula crispata*; Müller, in 1897, published the Australian and Tasmanian plant, also sterile, as *B. Wilhelmii*; and in New Zealand the fruiting plant has been described as *Streptopogon Hookeri* R. Br. It may be remarked here, however, that the publication of Hampe's plant as a distinct species was caused to a great extent by errors contained in Schwaegrichen's diagnosis of his species.

The distribution of the species is therefore found to be South America (Chili, Ecuador, and Patagonia) and Australasia (Australia, New Zealand, and Tasmania). Now this is a distribution, it may be noted, which has been found to occur in several species of plants, both phanerogamic and cryptogamic. Cardot (*Résult. Voyage Belgica* (*Botanique*), p. 10 (1901)) gives a list containing no less than twenty-six species of mosses which are peculiar to South America (Colombia, Andes of Ecuador, Chili, Peru, Juan Fernandez, and the Magellanic regions) and the Oceanic Isles (Australia, New Zealand, Tasmania, Auckland, and Campbell Islands). The same phenomenon of distribution occurs in certain phanerogamic plants (see Hooker's *Handbook N. Z. Flora*, and Grisebach's *Vegetation der Erde*, ii. 586).

A remarkable and thoroughly characteristic feature of *B. mnioides* has been almost entirely passed over by authors. This is the production of abundant gemmæ on the face of the nerve of the upper stem-leaves. In every case, *i. e.* in all the examples, both fruiting and sterile, from South America and Australasia, enumerated below, I have found these gemmæ to be present, often in great abundance; and the gemmiferous nature of the nerve seems to be as truly characteristic of the present species as it is in the case, *e. g.*, of *Tortula papillosa* Wils. No detailed description of these gemmæ has been hitherto given, and, curiously enough, no mention even of their occurrence is made by Schwaegrichen, Mitten,

Hampe, Müller, or Brotherus in their description of the plant. Wilson, however, noticed them in the New Zealand examples, remarking (*Fl. N. Zealand*, ii. 71), "Leaves somewhat gemmiferous at the apex." Brown also, in his diagnosis of *S. Hookeri*, described the leaf-nerve as "gemmaceous near the apex." The gemmæ are multicellular, and are somewhat variable in shape, being usually more or less oblong, but sometimes nearly square in outline, or they may be roundish. They are frequently aggregated into irregularly shaped masses, with projections spreading out on all sides (fig. 11). The gemmæ are at first green, but afterwards turn brownish; the external walls of the cells are more or less papillose. As transverse sections of the leaf-nerve show, the gemmæ are borne on peculiarly shaped cells projecting from the ventral surface of the nerve (figs. 6, 7). In general appearance, and in the order and manner in which they are produced from the leaf-nerve, the gemmæ bear a very close resemblance to those of *Tortula papillosa* Wils. The exact agreement in nearly every detail—a fact which is indeed remarkable—can be best seen by comparing my fig. 7 with that given by Correns (*Untersuch. über die Vermehrung der Laubmoose*, p. 80, f. 46) of *T. papillosa*.

The leaf-nerve of *B. mnioides*, as seen in transverse section (figs. 5–7), is composed of "pointer-cells,"* a single dorsal band of stereid cells, and a group of 4–6 "companion-cells."* The group of "companion-cells" dies out towards the apex of the leaf. The stem is formed of a few peripheral rows of brownish thick-walled cells (the external row of which has a crenulate outline) enclosing a central tissue composed of delicate polygonal wide-lumened cells with very thin flexuous walls, which are minutely thickened at the angles. There is no trace of a "central-strand." The stem is, in fact, formed exactly like that of *Streptopogon erythrodontus* (Tayl.) Wils., which is figured in my Monograph of *Streptopogon* (Ann. Bot. xvii. pl. viii. f. 20 (1903)).

(To be continued.)

NOTES ON TURRÆA.

By Edmund G. Baker, F.L.S.

Considerable difference of opinion exists as to the limits of the genus *Turræa*. M. C. De Candolle, our leading authority on Meliaceæ, in his monograph retains *Quivisia* as a distinct genus, but has a section of *Turræa* (Quivisiopsis) which is intermediate to some extent between *Quivisia* and *Turræa*. But, influenced no doubt by the floral structure of such plants as *Quivisia anomala*

* I propose the term "pointer-cells" as a translation of the German word "Deuter" for the wide-lumened cells with little-thickened walls of the leaf-nerve; and "companion-cells" for the German word "Begleiter" for the very small delicate thin-walled cells (cfr. Lorentz, Stud. zur vergleich. Anat. der Laubmoose (*Flora*, xxv. 247, 257 (1867); also Lorentz, Grundl. zu einer vergleich. Anat. der Laubmoose (*Pringsh. Jahrb. für wissenschaftl. Bot.* vi. 374, 378 (1867–68)).

O. Hoffm., described since the publication of this monograph, Dr. Harms considers that *Quivisia* and certain intermediate plants, as, for instance, the genus *Calodryum*, between *Quivisia* and *Turræa* are better treated as sections of *Turræa* than as distinct genera. In Engler's *Pflanzenfamilien*, iii. 4, p. 284, Dr. Harms diagnoses the following sections:—i. *Euquivisia*; ii. *Calodryum*; iii. *Calodryopsis*; iv. *Euturræa*; v. *Rutæa*. The section *Euturræa* in M. De Candolle's monograph includes Dr. Harms's two sections iv. and v., and is, I think, to be preferred. Dr. Harms's section *Rutæa* includes plants such as *T. Vogelii*, *T. Wakefieldii*, *T. nilotica*, having no particular structural affinity one with the other, and the nearest allies of some of them, such as *T. usambarensis* Gürke, are such plants as *T. Holstii* Gürke in Dr. Harms's group *Euturræa*.

The African plants (excluding the Mascarene), with trifling exceptions, fall into the section Euturræa C. DC. The exceptions being *T. heterophylla* Harms and *T. Cabræ* De Wild. & Dur. This latter species, the authors state, belongs to sect. Calodryopsis. In the annexed enumeration I have placed it in this section, but in the structure of the flower it differs in certain points from *T. anomala* Harms, and is nearer the Euturreæ.

An examination of the type of *T. abyssinica* Hochst. *β longipedicellata* Oliver, from Ankober, collected by Roth, shows it to be synonymous with *T. Holstii*, although geographically widely separated. I would also refer to *T. Holstii* plants collected in Somaliland by Miss Edith Cole and Mrs. Lort Phillips. Another Somaliland species, *T. lycioides* Baker, is synonymous with *T. parvifolia* Deflers, from Arabia; both are published in the same year, but the latter name must be adopted to avoid confusion with *T. lycioides* Baillon, from Madagascar. Another point of interest is the position of *T. heterophylla* Sm., which has been for long doubtful. The ovary of the type of this plant in the Banksian Herbarium has been dissected; it is 5-locular, and the plant is probably specifically identical with *T. lobata* Lindl.

The following is an enumeration of the African species of Turræa hitherto described. I have added the descriptions of two plants I am unable to identify with any of these; one gathered by Mr. T. Kässner on the Schimba Mountains, the other by Sir John Kirk in South Somaliland.

A. African Species.

Sect. Euquivisia Harms in Engler Nat. Pflanzenfam. iii. 4, p. 284.

1. T. heterophylla Harms, *l. c.*

Hab. Mauritius, *Commerson*! *Bojer*. Bourbon, *Bory*. Africa, east shore, Montgomery in Herb. DC. *fide* C. DC.

Sect. Calodryopsis Harms, *l. c.*

2. T. Cabræ De Wild. & Dur. Illustr. fl. Congo, i. (1898) p. 31, tab. xvi.; Reliq. Dewev. tome i. fasc. i. p. 40 (1901).

Hab. Lower Congo, *Capt. Cabra*. Chimbete, *Dewevre*, no. 316. Chinganga, *Dewevre*, no. 350.

Sect. Euturræa C. DC. Suites au Prodromus, i. p. 436.

A. Ovary 4–5-locular.

3. T. abyssinica Hochst. in Schimper exsicc. n. 191; Richard Fl. Abyss. i. p. 106, t. 25 (1847); Oliver, Fl. Trop. Africa, i. p. 331 (1868).

Hab. Abyssinia, *Schimper*, nos. 28 & 191! *Quartin-Dillon* and *Petit*!

I have dissected several flowers of *Schimper*, no. 191. Some are tetramerous, others pentamerous.

4. T. Holstii Gürke in Engler, Bot. Jahrb. xix. Beibl. 47, p. 35 (1894). *T. abyssinica* Hochst. *β longipedicellata* Oliv. *l. c.*

Hab. Abyssinia, Ankober, *Roth*! Somaliland, Dara-as, *Miss Edith Cole*! *Mrs. Lort Phillips*! Usambara, Lutindi Ngambo Bangarra, alt. 1500 metres, *Holst*, no. 3392! Uhehe, *Goetze*, no. 752.

5. T. kilimandscharica Gürke in Engler Pflanzenw. Ost-Africa, Theil c. p. 230 (1895).

Hab. Karrakia, Schlucht, *Volkens*, no. 2004! Alt. 1900 metres.

6. T. mombassana Hiern. ex C. DC., *l. c.* p. 439 (1878).

Hab. Zanzibar Coast, near Mombassa, *Hildebrandt*, no. 1973! Pemba River, *Kässner*, no. 353! Lake Naivascha, alt. 7000–8000′, *J. Thomson*!

7. T. obtusifolia Hochst. in Flora, xxvii. p. 296 (1844); Sonder in Fl. Cap. i. p. 245 (1859–60); Hook. fil., Bot. Mag. t. 6267 (1876).

Hab. Natal Bay, *Krauss*, no. 308! Albany, *Bowie*! Kleinemond, *Mac Owan*, no. 202! Zululand, *W. T. Gerrard*, no. 109! Matabeleland, Matoppo Hills, *Mrs. Evelyn Cecil*, no. 105! Lake Ngami, *M'Cabe*!

Var. *microphylla* C. DC., *l. c.* p. 440.

Hab. South Africa, *Burchell*, no. 4106!

8. T. cuneata Gürke in Engler Pflanzenw. Ost-Africa, Theil c. p. 231 (1895).

Hab. East Tropical Africa, *Fischer*.

A plant collected at Galunka by T. Kässner, no. 830, is evidently closely allied to *T. cuneata* Gürke, which I only know from the description. The leaves are cuneate-obovate. The flowers axillary and generally solitary. Stamens 10, inserted near the apex of the tube, which is laciniate. Petals ± 4·0 cm. long, broader above than below. Ovary hairy above, 5-locular. The Mascarene *T. obovata* Gürke is also an allied plant, but is tetramerous.

9. T. heterophylla Smith in Rees's Cyclop. no. 6 (1817) non Sonder.

T. quercifolia Don Gen. Syst. i. p. 678 (1831).

Rutæa quercifolia Roemer, Syn. fasc. i. p. 94 (1846).

T. lobata Lindley in Bot. Reg. xxx. tab. 4 (1844).

Rutæa lobata Roemer, *l. c.* p. 94 (1846).

Hab. Cape Coast, *Brass*! *Afzelius*! Near Mahela, *Scott Elliot*, no. 4029! Sierra Leone, *Whitfield*.

The type of Smith's plant is in the Banksian Herbarium, and the ovary is 5-locular. I have compared this with the figure of *T. lobata*, and there seems little doubt that these two plants are conspecific.

T. graciliflora Schlecht in Linnæa xxv. p. 217, is perhaps synonymous with the above.

10. T. PARVIFOLIA Deflers in Bull. Soc. Bot. Fr. xlii. p. 301, t. 6 (1895).

T. lycioides Baker in Kew Bulletin 1895, p. 212.

Hab. Somaliland, Golis Range at Dooloob, *Miss Edith Cole*, *Mrs. Lort Phillips*! Arabia, at Bilad Fodhli and Bilad Soubaihi, alt. 400–600 metres, *A. Deflers*.

A species easily recognized on account of its small leaves and flowers with petals 7–9 mm. long. The staminal tube is hairy within. The adoption of the name *T. parvifolia* Deflers for this plant avoids confusion with *T. lycioides* Baillon, a different species.

B. Ovary 8-locular.

11. T. RANDII Baker fil. in Journ. Bot. xxxvii. p. 427 (1899).

Hab. Rhodesia, Salisbury, *Dr. Rand*, no. 562!

Allied to *T. nilotica* Kotsch. & Peyr.; for distinguishing characteristics see *Journal of Botany*, l. c.

c. Ovary 9–20-locular.

12. T. VOGELII Hook. fil. Fl. Nigrit. p. 253 (1878); Oliver, *l. c.* p. 330.

Hab. Upper Guinea, Fernando Po, *Vogel*, *Mann*! Old Calabar, *Milne*! Cameroons, *Zenker*! Lagos, *H. Millen*!

Var. SCANDENS C. DC., *l. c.* p. 444.

Hab. Angola Distr., Golungo Alto, *Welwitsch*, no. 1300!

Var. PROPINQUA Oliver, *l. c.* p. 331.

T. propinqua Hook. fil., *l. c.* p. 254 (1878).

Hab. St. Thomas, *Don*!

A curious form of this plant was collected on the Como River, seventy-five miles from Gaboon, by G. L. Bates, no. 470. The flowers are in clusters of 5, with very long pedicels.

The plant recorded under this species from Princes Island, *Barter*, in the *Flora of Tropical Africa*, is not in a satisfactory state to determine, and seems very doubtful.

13. T. PROCERA Welw. ex C. DC., *l. c.* p. 444.

Hab. Princes Island, Bahia de S. Antonio, *Welwitsch*, no. 1299!

Closely allied to *T. Vogelii* Hook. fil.

14. T. LAMYI Bonnet in Bull. Mus. d'Hist. Nat. 1901, no. 6, p. 284.

Hab. Banks of River Oubangui, *M. Foureau*.

This plant and the next are only known to me from the descriptions. They are allied to *T. Vogelii* Hook. fil. *T. Lamyi* is said to differ by the larger shortly pedunculate flowers being solitary or 2–3 together, not 8–10. Staminal tube towards apex broadening. Petals $2\frac{1}{2}$–3 cm. long.

15. T. FISCHERI Gürke in Engler Bot. Jahrb. xiv. p. 308 (1892).

Hab. East Africa, *Fischer*, nos. 93, 94.

16. T. NILOTICA Kotschy & Peyr. Pl. Tinn. p. 12, t. 6 (1867).

Hab. Nile Land, Djurland, *Heuglin*. Gondokoro, *Knoblecher*. South Central, Victoria Fall, Zambesi, *Dr. Meller*! Mozambique Distr., Shire River, *Sir J. Kirk*! Zanzibar, *Hildebrandt*!

17. T. ROBUSTA Gürke in Engler Bot. Jahrb. xix. Beibl. 47, p. 35 (1894).

Hab. Usambara, Kwa Mshusa, near Gonja, alt. 1000 metres, *Holsv*, no. 9069!

Sir H. Johnston collected on Mt. Kilimanjaro in 1884 a plant which is either this species or a very close ally. It differs from *T. Volkensii* by having shorter flowers and more glabrous leaves.

18. T. VOLKENSII Gürke, *l. c.* p. 34.

Hab. Kilimanjaro, Marangu, alt. 1500 metres, *Volkens*, n. 257!

19. T. GOETZEI Harms in Engler Jahrb. xxviii. p. 415 (1900).

Hab. Uhehe, *Goetze*, no. 747.

The following is the description of a plant gathered by T. Kässner at Galunki (no. 802), evidently a close ally of *T. Goetzei*. It differs in several points, notably in having only 12 stamens, and leaves with a close tomentum below, and may be specifically distinct.

Rami puberuli satis lenticellosi. Folia petiolata ovalia vel obovata basi rotundata vel latissime cuneata apice obtusa et mucronata supra glabra (costæ nerviisque puberulis) subtus præcipue foliis junioribus tomentosa, nerviis primariis sicut costa subtus prominentibus utrinque 9–12 adscendentibus inter se fere parallelis. Racemi in axillis foliorum puberuli vel sericei. Calyx campanulatus extus puberulus dentibus acutis. Petala oblongo-oblanceolata extus puberula, tubo stamineo cylindraceo apice ampliato extus sparse pubescente apice in lacinias 12 fisso, antheris 12 breviter mucronatis distincte intra summum tubum insertis. Ovarium albo-hirsutum, stylo elongato, superne glabro loculis 12.

20. T. USAMBARENSIS Gürke in Engler Pflanzenwelt Ost-Africa, Theil c. p. 231.

Hab. Amboni, Mbaluland, *Holst*, no. 2579!

An ally of *T. Holstii* Gürke, with flowers generally in pairs on slender pedicels.

21. T. FLORIBUNDA Hochst in Flora, xxvii. p. 297 (1844).

Rutæa floribunda Roemer Syn. fasc. i. p. 93 (1846).

T. heterophylla Sonder in Fl. Capensis, i. p. 245, non Smith; Wood, Natal Plants, t. 246.

Hab. Natal, near Umlass River, *Krauss*, no. 342! Berea, near Durban, *Wood*, no. 811! Zululand, *W. T. Gerrard*, no. 252! River Umzunyati, *Wood*! Nyasaland, Mt. Maloxi, alt. 4000–5000 ft., *A. Whyte*!

22. T. JUNODI Schinz in Mem. Herb. Boissier, no. xii. p. 45 (1900).

Hab. Delagoa Bay, *Junod*, no. 118. Daruma River, *Kässner*, no. 296! Magi Chumnoi, *Kässner*!

I have to thank Prof. Schinz for kindly comparing a flower and leaf of the plant collected by Kässner on the Daruma River with the type.

23. T. WAKEFIELDII Oliv. in Ic. Plant. t. 1489.

Hab. Mombassa, Dar es Salaam, *Wakefield*! Umba Valley, Dec. 1892, *Lieut. C. S. Smith*!

24. T. Kirkii, sp. nov.

Species sect. Euturrææ C. DC. ad *T. Wakefieldii* Oliv. et *T. Junodi* Schinz accedens.

Cortex nigrescens. Folia petiolata coriacea oblongo-lanceolata vel ovato-lanceolata supra nitida apicem versus attenuata apice obtusa nervis primariis utrinque circ. 10–12 sicut costa subtus subprominentibus supra impressis. Flores in cymis axillaribus dispositi. Pedicelli albo- vel cinereo-sericei aliquantulum crassi. Calyx campanulatus extus cinereo-sericeus dentibus quam tubo multoties brevioribus. Petala elongato-linearia apicem versus aliquantulum dilatata, tubo stamineo apice in 20 lacinias lineares et acutas fisso, antheris 10 brevissime mucronulatis intra summum tubum insertis. Ovarium ± 14-loculare.

Hab. South Somaliland, Kismayo, *Sir John Kirk*, 1876.

Leaves coriaceous, shortly petiolate, oblong-lanceolate or ovate-lanceolate, lamina 6–8 cm. long, often about 4·0 cm. broad at the broadest point, 10–12 lateral veins which are impressed above and subprominent below, tapering to apex, the actual apex obtuse, rounded or broadly cuneate at the base. Flowers pentamerous, in axillary clusters, several together. Calyx hairy externally, lobes short, somewhat concave. Petals strap-shaped, pubescent externally; those measured were 3·0 cm. long, but were not fully developed. Staminal tube ± 4 cm. long, laciniate at apex, laciniæ narrow acute, tube somewhat hairy internally. Anthers 10 inserted within the tube near the summit, shortly apiculate. Ovary multilocular, not densely hairy externally as in *T. Wakefieldii* Oliver. Style puberulous.

The leaves in *T. Kirkii* are coriaceous, oblong-lanceolate or ovate-lanceolate, while those in *T. Wakefieldii* are rhomboid elliptical or obovate, and the base much more distinctly cuneate.

25. T. Kaessneri, sp. nov.

Species ad *T. Wakefieldii* Oliv. accedens.

Ramuli primum puberuli dein glabri. Folia ovata vel oblongo-ovata acuminata basi rotundata vel cuneato-rotundata juniora utrinque dense strigoso-pubescentia adultiora subtus strigoso-pubescentia supra sparse pubescentia nerviis subtus subprominentibus. Flores in cymis umbelliformibus axillaribus sæpissime 2-floris dispositi interdum flores solitarii breviter pedicellati. Calyx campanulatus dentibus deltoideis externe pubescens. Petala linearia apicem versus aliquantum dilatata, tubo stamineo apice 20-fido laciniis linearibus quam petala *T. Wakefieldii* conspicue longiora. Stamina 10 intra summum tubum inserta, antheris apiculatis. Ovarium fere glabrum circ. 11-loculare.

Hab. Schimba Mts., at an altitude of 1500 ft. In flower March 14, 1902. *T. Kässner*, no. 384.

Branches with a rather dark cortex. Leaves ovate or oblong-ovate acuminate 7·0–9·5 cm. long, 3·0–3·5 cm. broad, petiole 3–4 mm. long, lateral veins ascending arcuate. Flowers in axillary few-flowered cymes. Peduncles pubescent, generally over 1 cm. long. Calyx pubescent externally. Petals linear, slightly enlarging towards the summit, about 9·5 cm. long. Staminal tube nearly 9 cm. long. Ovary nearly glabrous.

Differs from *T. Wakefieldii* in its much larger flowers, fewer-flowered cymes, nearly glabrous ovary, and leaves not nearly so shining above; from *T. Junodi* by the much larger acuminate or subacuminate leaves and longer petals.

B. Mascarene Species.

The Mascarene species present much greater diversity in floral structure; this can be seen by comparing the eight beautiful plates prepared for M. Grandidier's *Histoire de Madagascar* (Botanique) Atlas, ii. tt. 252, 252A, 253, 254, 254A–D (1893).

The species known up to the present time are as follows:—

Sect. Euquivisia Harms in Engl. Pflanzenfam. iii. 4, p. 284.

1. T. decandra Harms, *l. c.*

Quivisia decandra Cav. Diss. vii. p. 211 (1789); A. Juss. Mem. Mel. p. 65, t. 12, fig. 1A (1830).

Hab. Bourbon. Madagascar, *Chapelier*.

Sect. Calodryum Harms (= *Calodryum* Desvaux, Ann. Sc. Nat. 1826, ix. p. 401).

2. T. tetramera Benn. Pl. Jav. rar. p. 184 (1890).

Scyphostigma Benettii Roem. Syn. i. p. 94 (1846).

Quivisia tetramera C. DC., *l. c.* p. 432.

Hab. Madagascar, *J. V. Thompson*!

3. T. lanceolata Cav. Diss. vii. p. 361, t. 205, f. i. (1789); Baillon in Hist. Madagasc., Botanique, t. 252.

Calodryum tubiflorum Desv., *l. c.*

Hab. Madagascar, *Commerson*! Sud Betsileo, Wald von Ankafina, *Hildebrandt*, no. 3969 d.

4. T. grandifolia Harms, *l. c.*

C. grandifolia Scott Elliot ex Harms, *l. c.*

Hab. Madagascar, near Ft. Dauphin, *Scott Elliot*!

5. T. Pervillei Baillon, Adansonia, x p. 252 (1875); Hist. i. Madagasc. (Bot.), t. 252A.

Hab. Madagascar, Ambongo, *Pervillé*, no. 562!

Flowers tetramerous. Anthers differ markedly in structure from those of *T. lanceolata* Cav., only shortly mucronate.

6. T. cuneifolia Baker in Journ. Linn. Soc. xxv. p. 305 (1890).

Hab. Madagascar, *Baron*, no. 5263!

A close ally of *T. Pervillei* Baillon.

Sect. Calodryopsis Harms *l. c.*

7. T. anomala Harms *l. c.*

Quivisia anomala O. Hoffman, Sert. Pl. Madagasc. p. 10 (1881).

Hab. Madagascar, Ambohitsi, Amber-Gebirge, *Hildebrandt*, no. 3391!

8. T. ambohitsiana Baillon in Hist. Madagasc. (Bot.), t. 253.

Hab. Madagascar.

Perhaps identical with the preceding, in which case this name stands.

9. T. Boivini Baillon in Adansonia, xi. p. 252; C. DC. *l. c.*
Hab. Madagascar, De Rigny Bay, *Boivin*.

10. T. Fockei Buchenau in Abhandl. Bremen, vii. p. 14 (1880–82).
Hab. North-west Madagascar, Maevasamba.
Ovary 8-locular. Leaves obovate, obtuse, with a cuneate base. Petals 40 mm. long. Stamens 8.

Sect. Euturræa C. DC. *l. c.*

α. Staminal tube at apex divided into rather broad oblong o ovate-oblong laciniæ.

* Anthers glabrous.

11. T. rhamnifolia Baker in Journ. Linn. Soc. xxv. p. 305 (1890).
Hab. Madagascar, Province of Androna, *Baron*, no. 5706 !
Leaves 4–5 cm. long, 2·30–3·0 cm. broad. Flowers in axillary clusters. Calyx globose, campanulate, teeth short. Petals ± 3·50 cm. long, conspicuously broader above. Anthers 10, inserted within the summit of the tube. Apex of the tube divided into rather broad laciniæ, not like those in *T. Junodi* Schinz or *T. Wakefieldii* Oliver, which are narrow, but subsimilar to those in *T. Grandidieri* Baillon. Anthers quite dissimilar from those in *T. Grandidieri*, glabrous, shortly and acutely mucronate. Stigma globose. Style glabrous. Ovary about 8-celled.
Harms places this in sect. *Rutæa*.

** Anthers hairy.

12. T. Grandidieri Baillon in Hist. Madagasc. (Bot.), t. 254 A.
Hab. Madagascar.
Possibly allied to preceding, but differs entirely in structure of anthers and stigma.

β. Laciniæ 8, lanceolate, rather small, bifid.

13. T. rhombifolia Baker in Journ. Linn. Soc. xxii. p. 458 (1887).
Hab. Madagascar, *Baron*, no. 4569 !
Allied perhaps to *T. mombassana* Hiern.

γ. Laciniæ 8–10, quadrate, bifid, short.

14. T. venulosa Baker, *l. c.*
Hab. Madagascar, *Baron*, no. 4199 !
Leaves coriaceous, shining above, veins prominent above and below. Petals strap-shaped, staminal tube 3·50 cm.

15. T. Richardi Baillon in Adansonia, xi. p. 252 (1875); Hist. Madagasc. (Bot.), t. 254.
Hab. Madagascar.

δ. Laciniæ 8, triangular, lanceolate.

* Anthers hairy.

16. T. lycioides Baillon, Hist. Madag. (Bot.), t. 254 D, non Baker.
Hab. Madagascar.

** Anthers not hairy.

17. T. Bakeriana Baillon, *l. c*, t. 254 c.
Hab. Central Madagascar, *Baron*, no. 2090 !
Flower tetramerous.
Specimens have been distributed from Kew named incorrectly *Calodryum tubiflorum* Desv. No description of *T. Bakeriana* appears to have been published, but the excellent figure cited leaves no doubt as to the identity of Baron's plant.

ε. Laciniæ 16, linear.

18. T. obovata Gürke in Engler Bot. Jahrb. xiv. p. 308 (1892).
Hab. Madagascar, South Betsileo, Wood of Ankafina, *Hildebrandt*, no. 3969 ♂ ! ; Madagascar, *Baron*, no. 111.
Ovary 4-locular. Perhaps identical with *T. Bakeriana* Baill., but this latter is figured with the apex of the staminal tube divided into 8 triangular lanceolate laciniæ, while in *T. obovata* Dr. Gürke states there are 16 linear laciniæ.

ζ. Laciniæ of staminal tube more numerous, often 20, narrow, linear lanceolate.

19. T. malifolia Baker in Journ. Linn. Soc. xxv. p. 305 (1890).
Hab. Madagascar, Province of Androna, *Baron*, no. 5919 !
Leaves 4–7 cm. long by 2·50–2·75 broad. Calyx-tube glabrous, staminal tube 6 cm. long, laciniæ narrow.
Allied to *T. Wakefieldii*.

20. T. producta Baillon in Adansonia, xi. p. 254 (1875) ; C. DC. *l. c.* p. 443.
Hab. North-west Madagascar, *Perrillé*.

21. T. sericea Smith, Icon. ined. t. 12 (1789) ; C. DC. *l. c.* p. 445, cum syn. ; Baillon, Hist. Madagasc. (Bot.), t. 254b.
Hab. Madagascar, *Commerson*, *Boivin* !, *Baron*, no. 2990 ! Comoros, *Humblot*, no. 352 !

22. T. maculata Smith, Icon. ined. t. 11 (1789) ; C. DC. *l. c.* p. 443.
T. glabra Cav. Diss. vii. p. 360, t. 204 (1789).
Rutæa maculata Roem. Syn. fasc. i. p. 93 (1846).
Hab. Madagascar, Herb. Juss.

23. T. Kindtii Buchenau in Abhandl. Bremen, vii. p. 15 (1880–82).
Hab. Madagascar ; Andranovaka, between Vohemar and Fassi.

η. Laciniæ bifid ; shape not described in original description.

24. T. Hildebrandtii O. Hoffmann, Sert. Pl. Madagasc. p. 10.
Hab. North-west Madagascar ; Semberano, *Hildebrandt*, no. 32736.
Ovary 5-locular.

KANTIA SUBMERSA IN BRITAIN.

By Albert Wilson, F.L.S., and J. A. Wheldon, F.L.S.

In June, 1900, we collected a fine hepatic on Cockerham Moss, West Lancashire, which was for a time laid aside as a form of *Kantia trichomanis*. We submitted a series of our forms of *Kantia* recently to Mr. Macvicar, with a view to the separation of *K. Sprengelii* (which was found to be of frequent occurrence with us), and he suggested that the Cockerham Moss plant might possibly prove to be *Kantia submersa* Arnell. After examining a further supply, Mr. Macvicar was convinced that our plant should be referred to that species; but as material for comparison was not available, and the species had not been recorded as British, he suggested that we should refer it to Herr H. W. Arnell, of Upsala, for confirmation.

That authority on the genus kindly informs us that the plant is typical *Kantia submersa* Arnell, and that our specimens are specially interesting on account of the presence of gonidia-bearing surculi, which had not been observed on the species previously. *Kantia submersa* was first found by Dr. O. Nordstedt in Lake Sjöbacksjö, Sandhem, in the province of Vestergötland, Sweden, and its description by Herr H. W. Arnell (in *Rev. Bryologique*, 1902, p. 30), to which we have added that of the gonidia, is as follows:—

"*Sterilis*, submersa, foliata 2–3 mm. lata, inferne obscure viridis, superne juvenilis læte luteo-viridis. *Caulis* simplex vel hic illic ramum emittens, 4–5 cm. longus, fragilis, viridis, vetustior nigrescens, cellulis corticalibus circiter 20, elongate rectangularibus, ex axillis amphigastriorum rhizinas paucas et breves emittens. *Folia* applanate disticha, sat remota, æqualia, longitudinaliter affixa, plana vel in apice parum deflexa, e basi lata et inferne decurrente paullulum oblique ovata, in apice integra sed obtusissime acuminata; cellulæ basilares majores 0·045–0·065 mm. longæ, 0·03 mm. latæ, elongate hexagonales, apicales minores 0·03–0·35 mm. longæ et latæ, hexagonales-quadratæ, membranis tenuibus, ad angulos non incrassatis, granulis chlorophylliferis uniseriatis in circuitu cellulæ sitis, media parte luminis hyalina. *Amphigastria* modo in innovationibus junioribus bene evoluta, adpressa, convexa, caule paullum latiora, semilunaria, ad vel paullum infra medium bifida, incisura lata et semilunari, lobis in parte basali 6–7 cellulas latis, oblique triangularibus, obtusis, vulgo distantibus. [*Surculi gonidiiferi* numerosi, erecti, graciles; apicem versus foliis suberectis magnitudine immo minoribus. *Gonidia* in apice surculi conferta, globosa vel ovaliformia, bicellularia, sate granulifera, membrana tenui.] Cetera ignota."

Hab. Sweden (Nordstedt). Denmark (Jensen). England, West Lancashire.

With us *Kantia submersa* grows immersed in pools in the wettest parts of sphagnum bogs, and forms large intricate patches of a light yellowish green above, becoming dark lurid-green below. The stems are elongate, with neatly bifarious leaves remaining of equal

size through a large proportion of their length. From *K. trichomanis*, the only British species with which it could be confused, it is readily separated by its colour, general habit, and especially by the very deep and widely lunate sinus of the amphigastria. None of our other British species are likely to be mistaken for it. A North American species, *K. aquatica* Underw., resembles it somewhat, but is more slender, of a light green colour, with rotundate, emarginate leaves. The gonidia are very similar to those of *K. trichomanis*. Some of them have very fragile 2–4-celled stalks, others appear to be sub-moniliform, but the dried capitula become so fragile that it is not easy to make out their exact arrangement. The loculi are filled with chlorophyll-granules.

A NEW BRITISH HEPATIC.

By Symers M. Macvicar.

Geocalyx graveolens (Schrad.) Nees. *Jungermannia graveolens* Schrad. Syst. Samml. Krypt. Gew. 2, p. 6 (1797). *Geocalyx graveolens* Nees, Hep. Eur. 2, p. 397 (1836). *Saccogyna graveolens* Lindb. Act. Soc. Sci. Fenn. p. 509 (1875). Monoicous. Shallowly cæspitose or creeping among mosses, light green or yellow green. Stems to about 20 mm. long, simple or with few branches, radiculose. Leaves obliquely inserted, horizontal or occasionally semi-vertical, imbricate or approximate, in the younger shoots more distant, quadrate-ovate, ventral margin rounded, dorsal margin nearly straight and slightly decurrent; bilobed $\frac{1}{5}$–$\frac{1}{4}$, in young leaves to $\frac{1}{3}$–$\frac{1}{2}$, lobes usually acute, frequently unequal, sinus rounded or blunt; texture firm, cuticle finely granulate, trigones small but distinct. Under leaves usually appressed, bifid to below the middle into two lanceolate entire lobes. Inflorescence on short branches proceeding from the axil of the under leaves; male bracts small, acutely bilobed with a tooth on the dorsal margin, antheridia usually single; archegonia few, developing with their branch into a fleshy pendulous sac (perigynium), which is cylindrical, having a few root-hairs on the surface, and 3–5 small unequally toothed bracts near the upper end. Calyptra joined for two-thirds of its length to the perigynium. Capsule nearly cylindrical.

Habitat.—Straggling among mosses on damp shady rocks near sea-shore close to the village of Kyle of Lochalsh, West Ross-shire; 3rd June, 1902.

I found this interesting addition to our hepatic flora on the west side of the small bay of Kyle. It was growing among *Mnium hornum*, *Lepidozia reptans*, *Kantia trichomanis*, *Diplophyllum albicans*, and the lax form of *Scapania resupinata*. In the immediate neighbourhood were *Blepharostoma trichophyllum*, *Bazzania triangularis*, *Cephalozia lunulæfolia*, *Mylia Taylori*, *Plagiochila spinulosa*, *Jungermannia incisa*, *J. ventricosa*, with *Harpanthus scutatus* and *Saccogyna viticulosa*.

The species which *Geocalyx* is most likely to be overlooked for

in the field are *Lophocolea heterophylla* and *Jungermannia ventricosa*. The former can be distinguished by its more branched stem; the leaves towards the apex of the stem usually entire or emarginate, those near the base being more or less deeply lobed; perianths, which are nearly always present, at once distinguish it. *J. ventricosa* is usually of a brighter green colour; leaves more transverse, especially towards the apex of the stem, and more concave, with gemmæ frequently present; under leaves are absent. When perigynia are present in *Geocalyx*, it is not possible to confuse it with any other European species. They were present in the Scottish plant, and appear to be generally frequent. The widely distributed Continental species, *Lophocolea minor* Nees, which should be looked for in Britain, bears much resemblance to *Geocalyx*. It is a smaller plant, lighter in colour, leaves more distant, margins straighter and almost invariably erose through being gemmiferous; the under leaves are patent and are easily seen; it is a limestone species.

Geocalyx is frequently found on moist naked soil and rocks, where it forms flat patches. It is given by Kaalaas as occurring in addition in Norway on decaying wood. This species is widely spread throughout Europe, being found also in Northern Asia and America, but appears to be almost everywhere rare. It has been found scattered over the whole of Norway from Smaalene to Tromsö, and reaching an altitude of 1000 metres (Kaalaas). It possibly occurs scattered throughout Britain, though doubtless rare. The time of fruiting is stated by Limpricht to be May and June, but it appears to rarely fruit, and usually when growing on soil where the perigynia can penetrate. I have not found male flowers on the Ross-shire specimens. I may mention that Herr F. Stephani has seen a specimen of the Scottish plant.

A DISEASE OF THE GOOSEBERRY.*

By A. Lorrain Smith.

In the early spring of 1902 I investigated some gooseberry bushes from Herefordshire that had been attacked by disease. Out of a ten-acre plantation of bushes, about two acres almost in the centre of the land were dying off. The soil on which they grew was a stiffish clay. The bushes had been grown from cuttings, and were seven years old. Some weeks later the owner reported that cuttings planted on a sandy soil in a nursery ten miles away from the original plantation were suffering in the same manner.

A careful study of the different parts of the plant showed that the branches and the deeper roots of the bushes were so far free from disease. The mischief seemed to be restricted to the base of the stem, just above and beneath the ground-level. In that region, and more especially above ground, the bark was much injured; it was raised and broken, or ready to split off altogether, and the bush

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* Read before the meeting of the British Association at Belfast, Sept. 17, 1902.

had died. At the damaged areas a number of black sclerotia were found on the outside of the bark, or half embedded in the cracks and inequalities caused by the disease. They varied greatly in size and form, but as a rule they were round and elongate, like small fragments of a stick. They were accompanied in some instances by *Botrytis*, the conidial form of *Sclerotinia*. It grew on the already formed sclerotia, or on the stem itself. In the affected parts, the whole of the inner cortex and bast was permeated by the mycelium of the fungus; the injury could be traced up the stem almost to the first branches, and downwards into the roots for some distance.

Parts of the stem and roots were placed in a damp chamber, and a very plentiful growth of *Botrytis* conidiophores was produced on the wood laid bare by the casting off of the bark. The fungus in the roots also developed in the moister atmosphere, and produced sclerotia at intervals along its length, with here and there tufts of *Botrytis*. Sclerotia were similarly treated, and soon became covered with a marvellous crop of *Botrytis*. Fluffy grey cushions rose all round the different sclerotia, reaching quite a centimetre in height, and continued growing for a considerable time. After growth had ceased the sclerotia crumbled away.

The conidiophores are of the typical *Polyactis* type. The brown stalks vary in width from 12 to 17 μ, and they reach a height of rather over half a millimetre before the first head of spores is formed. Several irregularly-placed branches are given off at the tip, and these branch again. The ultimate branchlets are slightly inflated at the end, and the spores are borne on small projections all over the somewhat globose area. The little stalks are scarcely noticeable when the spores drop off. The branches mostly become divided off from the main stalk by a cell-wall; they lose their contents and shrivel up as the spores mature. Any branch that is not so cut off grows out and bears similar heads of spores. The main stalk also continues to grow, and produces branched heads of spores at intervals of about one-third of a millimetre. The spores are oval in form, and are rather small, measuring from 8–11 μ by 4–6 μ.

A *Peziza* also grew from one of the sclerotia in the damp chamber, several specimens of which had been placed there on March 8th. On April 16th I first noticed the stalk of the *Peziza*, already about a centimetre in height; it emerged from the base of the sclerotium, and curved upwards through the *Botrytis* growth. Four days later, a slight depression developed at the tip, and in a fortnight, without much further expansion, the whole thing began to decay. I cut sections of the half-formed cup, and found that the hymenium had developed, the asci had burst, and the ascospores were mostly dispersed. A few still remained in position; they were oval in form, and measured from 10 to 12 $\mu \times 6$ μ. I could not get the measurements of an ascus, but the hymenium was some 160 μ in depth. The size of the spores and the general appearance of the brownish stalk correspond with the description of *Sclerotinia Fuckeliana*, the disease of vine leaves and twigs, of which the conidial form is *Botrytis cinerea*. De Bary states very emphatically in his morphology of the Fungi, p. 225, that the two forms do not grow from the same sclerotium. In this case they both grew together.

The owner of the bushes kindly forwarded a supply of surface-soil taken from the field where the diseased gooseberries had grown, and in it I planted potatoes, beans, and lettuces, all plants that have suffered from sclerotium disease. The first two plants remained entirely healthy. Some of the lettuces died off, and on a withered stalk I got *Botrytis cinerea* with small spores similar to the one found on the gooseberry, but it may not have caused the death of the lettuce; it may have been an after-effect only.

Botrytis cinerea is found everywhere on decaying vegetation. It is also very frequent as a parasite on living hosts. It grows freely as a saprophyte, and is easily and quickly cultivated. The growth of the fungus has been watched from stage to stage by many careful workers, and recent research seems to prove that this fungus is generally more or less of a saprophyte, even on living plants. The spores usually require a short stage of saprophytic growth to set them going before they can penetrate the cells of a living tissue. It has been pointed out that in the case of the lily disease described by Marshall Ward (2) the *Botrytis* spore which germinated and directly entered the leaf was of a very large type. The hyphæ secrete a poison—oxalic acid—which kills the cells ahead, and the fungus then lives on the dead tissue. Nordhausen (4) has stated, however, that he has seen the growing hyphæ of *B. cinerea* penetrate living cells, and that the action of the poison was noticeable only at some distance from the ends of the hyphæ.

Sclerotinia Fuckeliana, with its conidial form *Botrytis cinerea*, as already stated, is well known as a disease of the Vine, of which it attacks and destroys the leaves and young twigs. In this, as in nearly all the instances recorded, the *Botrytis* fungus and also the sclerotium forms prey on herbaceous plants, or on the young and tender parts of those of woody growth. The exceptions known to me are the young lime trees that were found by Ralph E. Smith (7) to be suffering from a sclerotium disease. They grew in a field of lettuces that had been destroyed by a similar fungus. The point of attack was the base of the stem, and the disease spread upwards. The other case is that of the peony disease, where the plant is attacked at the ground-level, and develops sclerotia on the woody stem. Some peony leaves were sent to me lately for investigation from a garden in Surrey. The leaves and petioles only were diseased, and they were covered with a growth of *Botrytis*. The stems in this case were uninjured.

I have for some time collected specimens of *Botrytis*, all of them presumably *B. cinerea*, which is now held to be synonymous with *B. vulgaris*. The size of the spores varies very considerably. I give the extreme measurements:—

On a withered herbaceous stalk from Hereford.	10–12 μ × 6–8 μ.
On a sweet chestnut, London	12–14 μ × 6–8 μ.
On a horse chestnut, Worcester	11–15 μ × 8 μ.
On a lily, locality unknown	10–17 μ × 8–11 μ.
On a diseased tulip, Hereford	11–20 μ × 6–10 μ.
B. cinerea var. *sclerotiophila* on umbellifer stalk, Dumfriesshire	10 μ × 5–6 μ.
Botrytis of gooseberry disease	8–11 μ × 4–6 μ.

The gooseberry *Botrytis* has the smallest spores of all that have come under my observation. The spores of the lily disease, studied by Marshall Ward, attained a size of 20–25 $\mu \times 15\ \mu$. Those of the lime-tree fungus, also a true parasite, measured up to 30 μ.

The gooseberry *Botrytis* spores were sown in a mixture of gelatine and plum decoction, and they developed a copious mycelium with abundant organs of attachment. These have been described by De Bary (1) and more recent workers. The tip of a filament sends out several swollen and somewhat ungainly hyphæ, the ends of which are pressed against the glass with which they come in contact. There then follows a confused branching and cell division. The contents of the mycelium gather into the clumps, the cells become very thick-walled and dark in colour, and finally there is formed a compact tissue, which resembles the outer layer of a sclerotium. I have not yet succeeded in inducing any further development of the clumps. De Bary says they have nothing to do with sclerotium formation.

I had an opportunity of comparing the formation of these clumps with somewhat similar black bodies that I obtained from a culture of the spores of *Monilia*, also a sclerotium-forming fungus. In a drop of gelatine the mycelium from *Monilia cinerea* spores also knotted itself up at intervals into clumps called by Woronin "horn-organs," which did not function as organs of attachment. They were very rich in contents, the rest of the filament being left almost empty; then followed the branching into smaller hyphæ with thick dark walls, and a black-looking body was formed, which Woronin (6) considers to be of sclerotic nature.

A culture of spores from the peony *Botrytis* gave very different results. There were no organs of attachment on the mycelium. A thick coil of loose hyphæ formed above the gelatine, possibly an incipient sclerotium that stopped short for lack of nourishment. In addition certain filaments branched copiously, and grew out into a funnel-shaped body, something like a "horn of plenty," and finally into an elongate, dark-coloured, wedge-shaped stalk of parallel branching filaments that curved up from the cover slip, the branching end being always next the glass. At a later stage conidiophores of *Botrytis* developed all over these stalks, which confirms the opinion that these are reserve bodies.

In a test-tube culture of the same spores a thick felt of white mycelium formed over the surface of the gelatine. Round the edges where it touched the glass a single almost continuous row of sclerotia were formed, and higher up the tube, where nourishment was scanty, there appeared in considerable numbers small editions of the elongate stalks that were developed in the hanging drop. The growth of this *Botrytis* is so distinctive that it must retain its specific rank as *Botrytis Pæoniæ* Mass. The other forms I have examined may all belong to *B. cinerea*, but probably we should find here, as Eriksson (5) has demonstrated for *Puccinia graminis*, and, recently, Marchal (8) for *Erysiphe graminis*, that physiological or biological races have been evolved, so that the disease is confined generally to one genus or species of plants in a given locality.

Kissling (3) gives an account of an attack on *Gentiana lutea*, no other plants being affected; and Nordhausen (4) records the disease as confined to *Allium ursinum* in the neighbourhood of Leipzig.

Crystals of oxalate of lime are abundantly formed in the cultures along with the growth of the *Botrytis* mycelium. In the test-tube culture the gelatine was liquefied near the surface, and a white layer of large, beautifully formed, octohedral and prismatic crystals was deposited on the surface of the firmer unchanged material near the bottom of the tube. The liquid was filled with spores that had become yeast-cells, and were budding out in great numbers.

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ACORUS CALAMUS IN ENGLAND.

By Arthur Bennett, F.L.S.

Mr. W. R. Clarke (*First Records*, ed. 2, 150) gives as the "first record" of Acorus in England (1666), "found by Dr. Brown near Lyn"—meaning King's Lynn in West Norfolk. The following extract from Sir Thomas Browne's Letters to Merrett * corrects this statement:—

"July 13, 1668.

"Perusing your catalogue of Plants, upon Acorus verus I find these wordes, 'found by Dr. Browne neere Lin,' wherein probably there may be some mistake, for I cannot affirme nor I doubt any other yt is found thereabout. Some 25 yeares ago I gave ar account of this plant unto Mr. Goodyeere† : & more lately to Dr. How,‡ unto whome I sent some notes and a box full of the fresh

* *Notes and Letters on the Natural History of Norfolk*, from the MSS. of Sir T. Browne, M.D., with notes by T. Southwell, F.Z.S., p. 58 (1902).

† John Goodyer, of Maple-Durham, in Hampshire.

‡ W. How, author of *Phytologia Britannica*.

Juli. This elegant plant groweth very plentifully and beareth its Julus yearly by the bankes of Norwich river, chiefly about Claxton and Surlingham, & also between Norwich & Hellsden bridge, so that I have known Heigham Church in the suburbs of Norwich strewed all over with it. It hath been transplanted and set on the sides of Marish pondes in severall places of the county, where it thrives and beareth ye Julus yearly."

This account carries us back to about 1643 (instead of 1666). If the plant was not known until 1596 "in Gerarde's garden"* it would seem that forty-seven years would be too short a time for the plant to get distributed in Norfolk. The Norfolk stations are all in East Norfolk. Leaving out of account all stations by rivers, where the plant may have been carried by cultivation, or planted, there remain stations on the head-waters of some rivers, *e. g.* Antingham Ponds, Rollesby (K. Trimmer); head of Stalham Dike (A. Bennett), &c.

An instance of extension of habitat that I have watched for some years occurs in the case of *Leersia oryzoides* on the Woking Canal. In Brewer's *Flora of Surrey* (1863) no station is given on the canal; Mr. H. C. Watson recorded it in the Ex. Club Report for 1868, published 1869, "by the canal near Woking Station—a new locality." It has now spread along the canal bank (on the same side) for 1½ miles abundantly, in large patches. This gives thirty-two years for the extension by 1½ miles of a species that has roots that are extensively creeping by long white stolons, Of course the traffic on the canal is very small, compared with that on the Norfolk rivers, so there is little chance of pieces of the *Leersia* being broken off, as might occur with the Acorus, and travelling many miles.

The consensus of opinion throughout Europe seems against the nativity of the Acorus, but the above bears somewhat in the opposite direction.

There is no evidence in these published letters how Merrett's reference to Lynn came about, for there is no record for West Norfolk of the species; the nearest station to the boundary of that vice-county is nine miles from it.

SHORT NOTES.

Silene noctiflora in Worcestershire. — On Aug. 28 I found this in fair plenty in a cornfield at Bredon. It is included in Appendix D to *Illustrations of the Natural History of Worcestershire* by Charles Hastings, M.D. (1834)—"a Catalogue of the most remarkable and interesting plants indigenous to Worcestershire, with their habitats," compiled by the late Edwin Lees—as growing "in a sandy field behind Birchen Grove, Broad Heath." It is on this authority, as may be seen from Watson's MS. in the Department of Botany of the British Museum, that the plant is entered

* See Journ. Bot. 1871, 164.

for Worcestershire in *Topographical Botany*. It is curious that Lees, in his *Botany of Worcestershire* (1867), not only omits this plant from the flora of the county, but includes it in a short list of plants "native to Herefordshire and not known as indigenous to Worcestershire"; he had probably found out that his former determination was erroneous. So far as I know, the only other records of its occurrence in the county are—(Aug. 1893) a single plant near Madresfield (R. F. Towndrow), and (July, 1900) a single plant at Malvern as a garden weed.—S. H. Bickham.

Althæa hirsuta (Journ. Bot. 1902, p. 400).—I gathered this on Eastern Green, Penzance, July, 1894, a locality where both rare British plants and aliens grow; and have in my herbarium a specimen labelled "Frizinghall nr. Bradford, Yorks. July, 1888. J. Beanland."—E. Armitage.

In July, 1894, Rev. R. P. Murray and I gathered this species in Charente-Inférieure, West France, growing on rough banks of the coast, far from houses. It had every appearance of being truly wild, and is stated by Lloyd to be common in the Department. If (as seems to be the case) it is indigenous there, why should it not, on *primâ facie* grounds, be equally so in the South of England, which was formerly a part of the European continent? The argument from comparatively recent discovery is of small weight in the case of such a very local plant.—Edward S. Marshall.

In July, 1901, my son found a few plants of *Althæa hirsuta* at the edge of a cultivated field (old sainfoin lay) growing on grass at the top of a bank that formed the boundary. The spot was about a quarter of a mile due south-east from Bredhurst Church. Early this year a few seedlings were found. Three drawn-up plants were found later on in the season, but they look not likely to perfect their seed in the long grass.—I know a single plant of *Salvia pratensis* in the adjoining parish of Hartlip, two and a half miles from Bredhurst. I have watched it dwindle, I am sorry to say, these six years. It is in too conspicuous a situation, and the children cannot resist tearing away its blue flowers, and I have found a labourer sitting on it at dinner.—*Ajuga Chamæpitys* I can generally depend on finding in this parish, with slight change of locale and much difference in robustness.—John Masters.

Goodyera repens in Norfolk (Journ. Bot. 1902, 325, 393).—I do not think this likely to have been brought from Scotland with Scotch firs; in Surrey, at least, they are raised from seed by nurserymen in large quantities, and are transplanted when about three years old. Its occurrence among heather, mentioned by Mr. Spurrell (pp. 325–6), is greatly in favour of its being native; thence it would readily spread to the more congenial fir-plantations. Another theory of origin is possible, *viz.* that the seeds, being so numerously produced, minute, and light, may have been wind-borne from northern stations.—Edward S. Marshall.

Corrections.—In Journ. Bot. 1901, p. 267, I recorded *Fumaria pallidiflora* Jord. and *F. muralis* Sonder from mainland, Orkney. Mr. H. W. Pugsley has since kindly revised my fumitories; he

determined the first as being his *F. purpurea* (i. e. *F. Boræi* Bab., *non* Jord.), and the second (No. 2415) as true *F. confusa* Jord.; quite a different plant from what was formerly so named by British botanists. My Orkney *F. Boræi* Jord. is confirmed; the West Sutherland plant is identical.—Edward S. Marshall.

NOTICES OF BOOKS.

Wood: A Manual of the Natural History and Industrial Applications of the Timbers of Commerce. By G. S. Boulger, F.L.S., F.G.S., &c. 8vo, pp. viii, 369. With 82 illustrations. London: Edward Arnold. Price 7s. 6d., net.

The primary title of this book, simple and monosyllabic as it is, is comprehensive, and covers a very large field of research, with numerous ramifications. The subject, indeed, is so vast, that but little beyond contributions to it have ever been attempted by a single writer. Forestry may be said to be the beginning of the whole matter, and books, reports, &c., on Forest Conservancy and the training of foresters are without number; numerous also have been the contributions from the engineers' and wood-workers' points of view. Mr. Boulger had a difficult task before him to do justice to such a subject in the form of a handy manual. That he was fully alive to this will be gathered from the conclusion of his very modest preface :—"How incomplete my work is may be gauged by the statement that, while there are undoubtedly several thousand woods used in various parts of the world, only about 750 are here enumerated, but these include most of those which are practically known in general commerce, and to have dealt with more would have necessitated a volume fully twice as large." In the first chapter, on "The Origin, Structure, and Development of Wood, and its Use to the Tree," Prof. Boulger travels, necessarily, over much of the ground gone over by previous writers, a list of the works referred to in the compilation of the book being given at the end. In the second chapter, on "The Recognition and Classification of Woods," there is much that affects both the scientific and practical expert. While agreeing with Prof. Boulger on the great importance of the knowledge of structural characters, the empirical knowledge or "rule of thumb" principles by which the carpenter, cabinet-maker, and woodworker generally are mostly guided, usually proves to be wonderfully accurate for practical purposes, such as hardness, density, and durability. A skilful and observant carpenter, for instance, will recognize the differences which separate Dantzic from Riga fir, and Riga from Swedish, though they are all the produce of *Pinus sylvestris*; or, again, the woods of the allied plants, *Picea excelsa* and *Larix europæa*, the first yielding Norway spruce timber, and the second common larch. An expert and experienced cabinet-maker will distinguish Rio from Bahia rosewood, Spanish from Honduras mahogany, and so on. Though these are niceties that can only come of experience and observation, they are of the

utmost value in the timber-yard and workshop, and should be encouraged amongst those who have perhaps neither time nor ability to study the microscopical characters of the materials they work in. We are glad to see that Prof. Boulger does not ignore the value of this knowledge, though he says that by it "species are seldom correctly distinguished"; in the woods we have referred to the distinctions sometimes go even to varieties.

The remarks on the hardness, colours, odours, and resonance of woods contain many hints that may be useful to all who have any dealings in wood; some few exceptions might be taken to the incidental references to certain woods, but they are for the most part correctly and more definitely described in the second part of the book, which is devoted to an alphabetical list of the woods of commerce, together with notes on their sources, characters, and uses. Passing over the chapters which deal with the "Defects of Wood," that is shakes, burrs, injuries, and diseases, and that treating of "Selection, Seasoning, Storage, and Durability," we find a good deal of information. In the two chapters dealing respectively with "The Uses of Woods" and "Our Supplies," we notice an important omission under the head of "Submerged Structures," namely that of African oak or teak (*Oldfieldia africana*), which is one of the best woods for piles and similar structures. We may also, perhaps, ask here why, at p. 142, in the alphabetical list of commercial woods, this special timber is referred to simply as "African," without the additional words oak or teak, which, however, occur further down in the paragraph; under oak and teak respectively, in the list of commercial woods, the reader is referred to the word "African."

With regard to the use of *Liquidambar styraciflua*, which has been dubbed "American red gum," for the purpose of the wood-paver, though its capabilities would seem not to equal jarrah or karri, it is probable that much of the wood used in the experimental trials was either unsound or badly seasoned. If the West Indian green ebony (*Brya Ebenus*) is correctly identified, as seems practically certain, with the Cocus wood of the flutemakers, it is scarcely enough to say (p. 103) that it "is considered well fitted for this purpose." It is, if we are not mistaken, the very best wood for wind instruments, after proper seasoning, exposure to air, dry heat, and wrapping in flannels soaked in linseed oil; its resonance is very marked. In connection with this wood it is interesting to note at p. 196, under "Ebony, American, Green, Jamaica or West Indian," the names "Cocus or Kokra of Jamaica." This latter is a Bengalese name for *Aporosa dioica*, of which Dr. Watt, in his *Dictionary of the Economic Products of India*, writes: "This has by botanists been identified as the tree which yields, in the West Indies, the coco-wood of commerce. The Indian plant should be carefully examined, to ascertain if the wood obtained from it is of equally good quality with that obtained from the West Indies." The question then arises, Are there two cocus or kokra woods, one from a leguminous, and the other from a euphorbiaceous plant?

In the alphabetical list of woods, the "Umzimbit" of South

Africa is referred to *Toddalia lanceolata*. At the time of the Colonial and Indian Exhibition in 1886 this remarkable wood attracted a considerable amount of attention, in consequence of its greasy nature and intense hardness. These two qualities were found to make it an excellent substitute for lignum vitæ for machine bearings. It was used for this purpose in the diamond-polishing machines in the Cape section of the Exhibition, and they proved to be seven times as durable as those of lignum vitæ. At first the origin of the wood was unknown, but afterwards it was referred to a leguminous tree, *Milletia caffra*. The wood is very distinct from that of the Toddalias, which Mr. Boulger rightly describes as white, hard and tough, while that of the Umzimbit used in the Colonial Exhibition machinery was distinctly marked by a purplish pink heart-wood and white tap-wood; so that it seems there is still some doubt about its identification.

We were somewhat surprised at not finding in the pages of the book the name of Mr. Herbert Stone. His paper on "The Identification of Wood," published in the Journal of the Society of Arts for Dec. 6th, 1901, is a noteworthy contribution to the history of the subject.

J. R. J.

Response in the Living and Non-Living. By JAGADIS CHUNDER BOSE, M.A., D.Sc., Professor, Presidency College, Calcutta. 8vo, pp. xix, 191; figs. in text, 117. Longmans. London, 1902. Price 10s. 6d.

IN this volume Professor Bose has put in a connected form the results of work extending over some years, which have been published in various memoirs by the Royal, Linnean, and other learned societies. The portion dealing specially with plants forms the subject of a paper which botanists have before them in a recent number of the Linnean Society's journal. In that communication the author, as those who heard his graphic presentation of his results at the meeting of the Society will remember, demonstrated a striking resemblance between the response of plant and animal tissue to external stimuli. But this resemblance, or perhaps we should say identity of response, is shared by inorganic matter. In the last chapter of the book the curves representing graphically the response of muscle or nerve, plant tissue and metal are brought side by side, and are seen to be similar, or in some cases, as, for instance, in the fatigue curves on page 185, identical in character. The conclusion is, that the assumption of a new "vital" force to explain vital phenomena is untenable. Botanists and animal physiologists alike must seek an explanation for their phenomena in chemico-physical principles. "Living response, in all its diverse manifestations, is found to be only a repetition of responses seen in the inorganic. There is in it no element of mystery or caprice, such as we must admit to be applied in the assumption of a hyper-mechanical vital force, acting in contradiction or defiance of those physical laws that govern the world of matter, Nowhere in the entire range of these response-phenomena—inclusive as that is of metals,

plants, and animals—do we detect any breach of continuity." Whether or not the whole explanation of the matter is before us, botanists, in company with workers in other branches of natural science, cannot but be deeply interested in Professor Bose's work, and admire his ingenuity in experiment, and the keen enthusiasm which he has brought to bear upon his subject.

A. B. R.

Flora Simlensis: a Handbook of the Flowering Plants of Simla and the neighbourhood. By the late Col. Sir Henry Collett, K.C.B., F.L.S. With an Introduction by W. B. Hemsley, F.R.S., and 200 Illustrations in the text drawn by Miss M. Smith; and a Map. London: Thacker & Co. 8vo, pp. lxviii, 652. Price £1.

This extremely well-printed, well-illustrated, and in every way satisfactory book marks a new departure in our colonial floras. Books devoted to the flora of some particular district, and suitable for use by the intelligent resident interested in plants but possessed of slight technical knowledge, have hitherto been wanting; and the array of the seven volumes of the *Flora of British India*, apart from their cost, is likely to deter such a one from pursuing the study. Moreover, the twenty-five years which elapsed between the publication of the first and last parts of that work, although far less than that which has already taken place with regard to other Kew floras still incomplete, prevents anything like a complete *aperçu* of the Indian flora.

The present volume is based on Sir Henry's collection, "made under ordinary conditions during a residence at Simla of about four years," and incorporating the extensive material accumulated at Kew; "he described his plants fresh from the field, and at once entered in his notebook copious memoranda and excellent drawings, and these he constantly used in working up his material." Its utility to the beginner is immensely enhanced by the admirable figures, justly described by Sir Henry as "beautiful and characteristic," "artistic and accurate," made by Miss Smith, under Mr. Hemsley's superintendence, mostly from dried specimens; they are to our mind a notable advance on her previous work. "The plants figured are all common Simla species, but British plants or their close allies are purposely omitted," so that even those at home will find the volume useful on account of its illustrations. The figure lettered *Habenaria ensifolia* seems to be rather *H. pectinata*; a new species of the genus—*H. Elizabethæ* Duthie—is described.

The volume is prefaced by a well-written notice of Collett from the pen of the Director of Kew Gardens, and Mr. Hemsley, on whom has devolved the task of seeing the work through the press, contributes a useful introduction and glossary. It will be remembered that Mr. Hemsley co-operated with Collett in the paper (Journ. Linn. Soc. Bot. xxviii. 1–150) on the plants collected by the latter in Upper Burma and the Shan States in 1887–8, in which the genus *Neocolletia* was established. It is of course to be regretted that the author did not live to see the completion of the work

which he has planned and carried out with such conspicuous success; he could, however, have had no more competent editor than Mr. Hemsley.

Fungus Diseases of Stone-fruit Trees in Australia and their Treatment. By D. McAlpine. Government Press, Melbourne, 1902. Pp. 165. Ten coloured plates, 327 figures.

Some time ago, Mr. McAlpine, the Government Vegetable Pathologist of Victoria, published an account of the fungi that are to be found on citrus trees; he has now issued an equally exhaustive account of the fungi that have been found growing on almond, apricot, cherry, peach, and plum trees. The first part of the work deals with a general account of the diseases due to attacks of fungi. He advises as to the kinds of fruit-tree that have proved resistent to attack, and gives careful instructions how to prepare and apply fungicides or any other method of cure deemed advisable in the case of trees that have become diseased. The second part gives a technical description of the various fungi. The author enumerates no less than one hundred and seventeen species, a large proportion of which are new to science. The grower will be relieved to find that of this alarming number only thirty-eight are parasitic; the others are saprophytes and harmless. An alphabetical list is printed, indicating their nature. It is somewhat surprising to find *Aspergillus glaucus* Link, one of our most common saprophytes, figuring as a parasite; Mr. McAlpine finds that it penetrates the fruit of the apricot, causing "mouldy core." *Hypholoma fasciculare*, a ubiquitous agaric, has also been regarded hitherto as a parasite, but he finds it destroying the roots of the cherry-trees, and he also reports it as doing damage to the roots of the raspberry.

The author has classified the fungi according to their habitat on stem, root, leaves, or fruit, and he gives lists of those to be found on each tree. The matter is arranged to enable the cultivator to identify the pests that threaten to destroy his trees, and the coloured plates give a graphic representation of the commoner diseases. Besides its importance to fruit-growers, the whole book forms a valuable addition to our knowledge of plant-pathology.

A. L. S.

BOOK-NOTES, NEWS, &c.

At the meeting of the Linnean Society on 20th November, Professor S. H. Vines continued the account of his observations upon the action of the enzyme contained in the secretion of *Nepenthes* which are epitomized in this Journal for 1902, p. 47. Since that time many other plants have been investigated with the object of ascertaining (1) whether or not a digestive enzyme were present, and (2) of determining the nature of its action. In almost all cases the presence of a proteolytic enzyme has been demonstrated. In the first instance plants which were known to possess a peptonizing enzyme were made the subject of experiment, with

the result that the enzyme was in all cases found to be proteolytic. The investigation was then extended to different parts of widely differing plants. In view of the fact that the proteids occurring naturally in plants are such (*e. g.* globulins and albumoses) as are readily digested, whereas those generally used (*e. g.* egg-albumin, fibrin) are much more resistent, the material to be digested was supplied in the form of the commercial product known as Witte-peptone, a mixture of albumoses and peptones. It was found that, with few exceptions, an enzyme was present which, as proved by the tryptophane-reaction, proteolysed these substances in 4–20 hours. Having established the presence of a proteolytic enzyme, the next step was to ascertain whether the tissues or juices of the plants under investigation were capable (like the pineapple, the fig, the papaw, &c.) of peptonizing the higher proteids. Evidence of the peptonization of fibrin and of the caseinogen of milk was obtained in the case of the juice of the melon, of the watery extract of the lettuce, and of the tissue of the mushroom. The results in other cases were either doubtful or negative. There was frequently evidence that the proteids naturally existing in the vegetable substances themselves had been digested. The experiments definitely establish the fact that an enzyme which actively proteolyses the simpler forms of proteid is present in all parts of the plant-body. But the question as to the precise nature of this enzyme still remains to be answered. Where proteolysis is accompanied by peptonization, it may be inferred that the enzyme is allied to the trypsin of the animal body. Where no peptonization, but only proteolysis, can be detected, it seems probable that the enzyme is allied to the erepsin recently discovered by Cohnheim in the small intestine. Possibly more than one enzyme may be active in certain cases.

At the same meeting, Mr. A. G. Tansley, in a paper, illustrated by lantern-slides, on "The Relation of Histogenesis to Tissue-Morphology," dealt with a few points bearing on the relation of histogenesis at the apex of the stem in the Pteridophyta to the morphology of the tissue-regions in the adult stem.

At the meeting held on 4th December, Mr. E. A. Newell Arber gave a digest, illustrated by lantern-slides, of his paper on "The Morphology of the Flowers and Fruits of the *Xylosteum* section of *Lonicera*." Among many members of the *Xylosteum* division of the genus *Lonicera*, union between the two flowers of the cyme, and between the two fruits, is a normal occurrence. A study of the morphology shows that the means whereby the synanthy is effected are not always of the same morphological nature. True synanthy occurs in *L. Xylosteum* and *L. nigra*, by the partial coalescence of the walls of the two ovaries in the median plane. Where the synanthy is complete, e. g. *L. alpigena*, the fruit is a false berry, in which one pericarp is formed from the walls of the two ovaries. In several species of *Lonicera*, a bracteolar sheath is present, partially or completely surrounding the gynæcia, which are usually free from one another. The two ovaries may, however, unite with the

bracteolar sheath in certain planes, *e. g.* in *L. cærulea* and *L. pyrenaica*, giving rise to a false synanthy. The resulting fruit is also a false berry. In *L. iberica* and *L. involucrata* there is no union, direct or indirect, between the two flowers of the cyme.

At the same meeting Mr. C. B. Clarke submitted a paper, "Note on *Carex Tolmiei* Boott," of which an abstract was read by Dr. D. H. Scott, Sec. L.S. The species was founded upon a specimen from the Columbia River, to which the author had subsequently added three other plants, and had combined their characters in a manner which has greatly puzzled North American botanists. Mr. Clarke has redescribed the original specimen, and has described two of the supposed component forms as new species.

The sadly inferior colouring of the later plates in the *Botanical Magazine* as contrasted with the earlier issues has long been a source of regret; but a special protest should be made against those in the December issue, especially as to *Aristotelia racemosa*. Nothing in the text indicates that the flowers are alternately red and yellow; and even if they were, the way in which the colour is applied, both to flowers and leaves, would discredit the most infantile colourist. The motto of the magazine—"Nature and Art to adorn the page combine"—should have been omitted from this number.

Mr. H. Hesketh Prichard has presented to the National Herbarium an interesting collection of plants from the Burmeister peninsula, South Patagonia. A provisional list of these, by Dr. Rendle and Mr. Britten, is published by Mr. Prichard in his handsome volume *Through the Heart of Patagonia*, recently published by Mr. Heinemann; a fuller account, with notes on critical and interesting species, will be published later in this Journal.

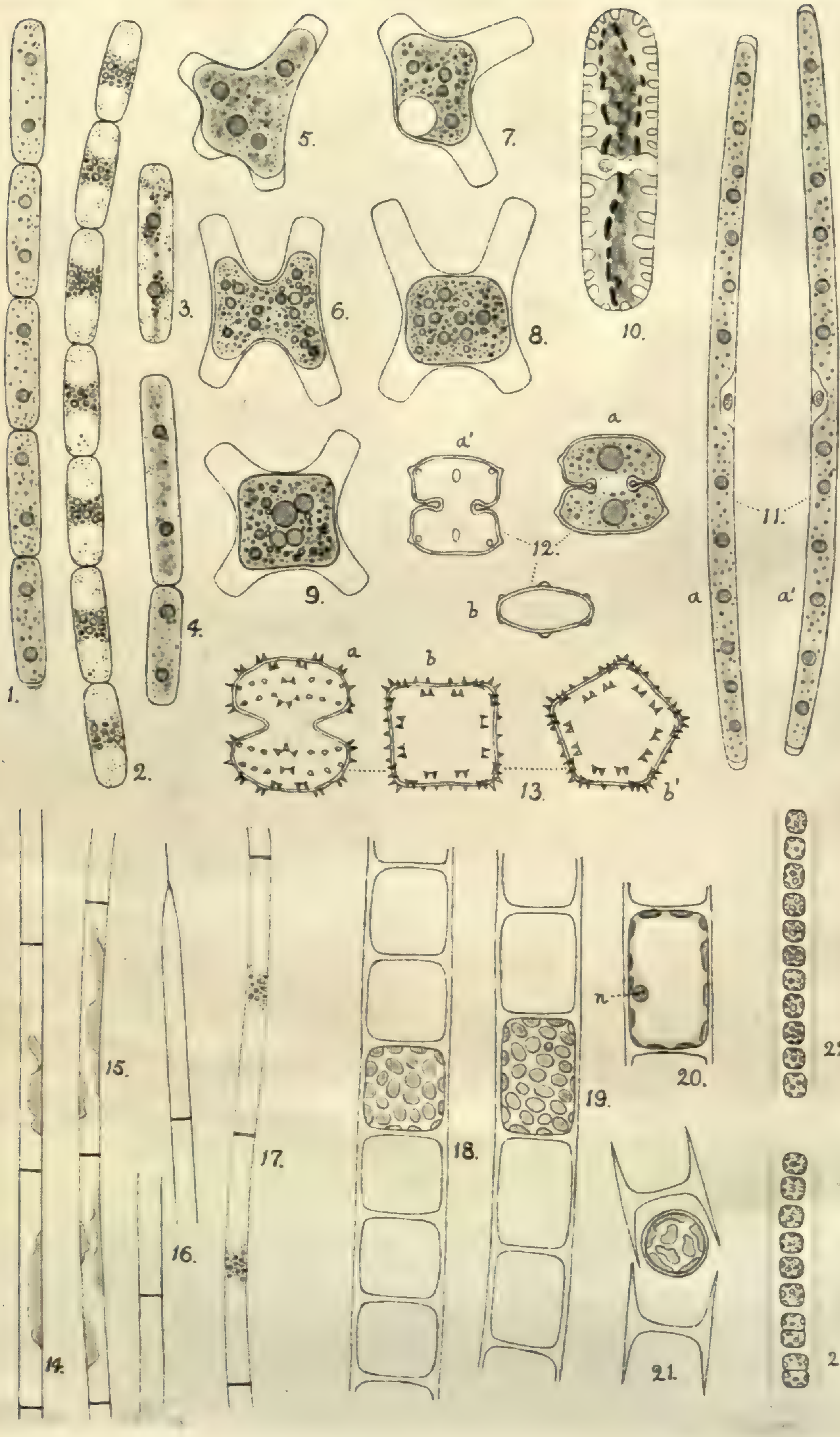
The dearest pamphlet we have seen for a long time is that by Dr. Rudolf Keller, "Reibungselektrische Untersuchungen an pflanzlichen Geschlechtsorganen" (Neugebauer, Prag). Including title-page and two blanks, it contains 42 pages, has no illustrations, and costs 5 marks!

"Appendix I. 1903" of the *Kew Bulletin* appeared last month. Whatever merits the *Bulletin* may lack, it can claim that of consistency in wrong dating. The Appendix is merely a list of seeds available for exchange: no authorities are appended to the names, some of which are evidently merely those of garden varieties.

Prof. G. S. West is engaged upon a text-book of British Freshwater Algæ, which will be published by the Cambridge University Press.

We regret to record the death, in his ninety-fourth year, of Dr. R. C. A. Prior, which took place at his residence, Halse House near Taunton, on Dec. 8. A notice of him will appear in our next issue.

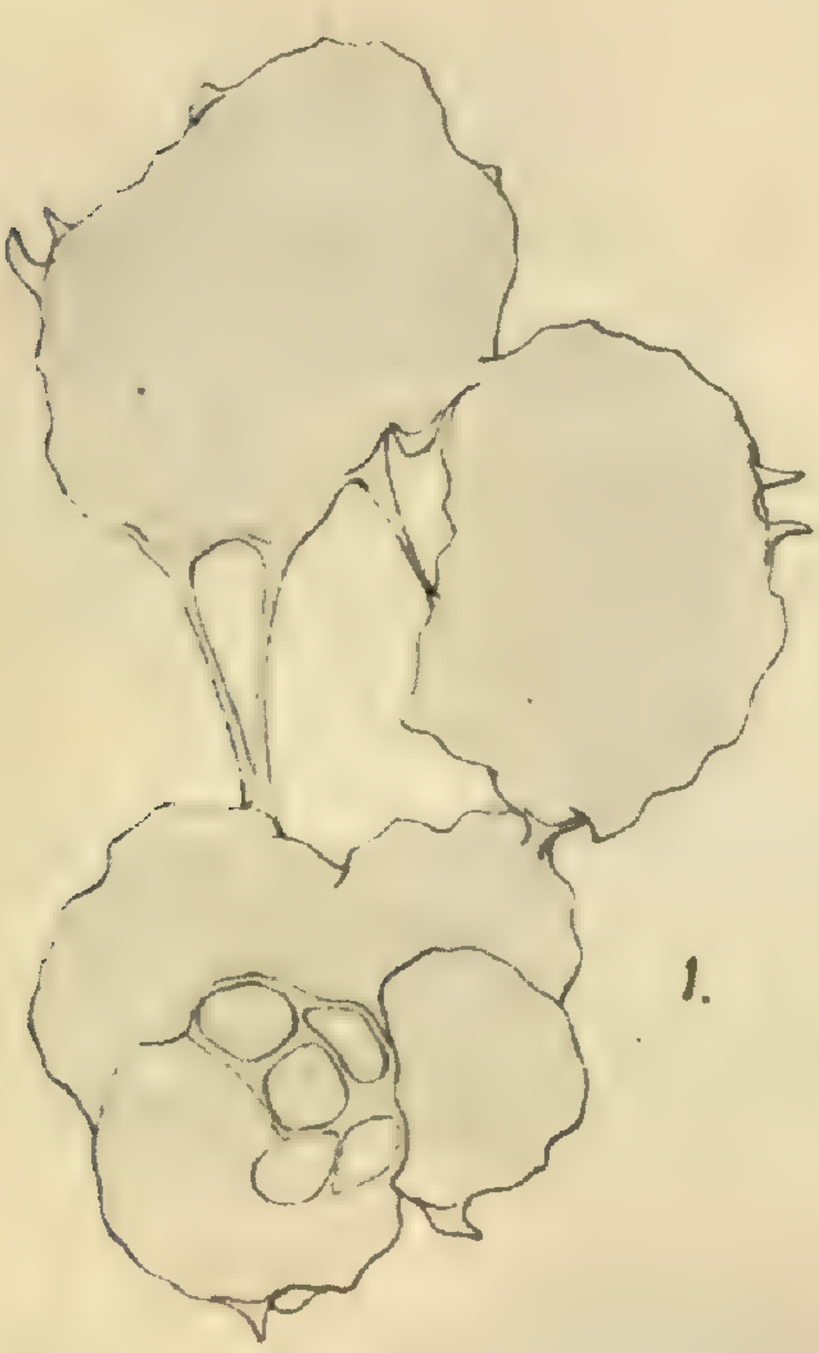
Part 3 of Mr. F. N. Williams's *Prodromus Floræ Britannicæ* includes "a revision of the British Hieracia"; the date on the cover is November, but our copy did not come to hand until Dec. 20. Copies may be obtained from Mr. C. Stutter, 110, High Street, Brentford, price 4s. 6d. post free.



G. S. West ad nat. del.

West, Newman proc.

FRESHWATER ALGÆ.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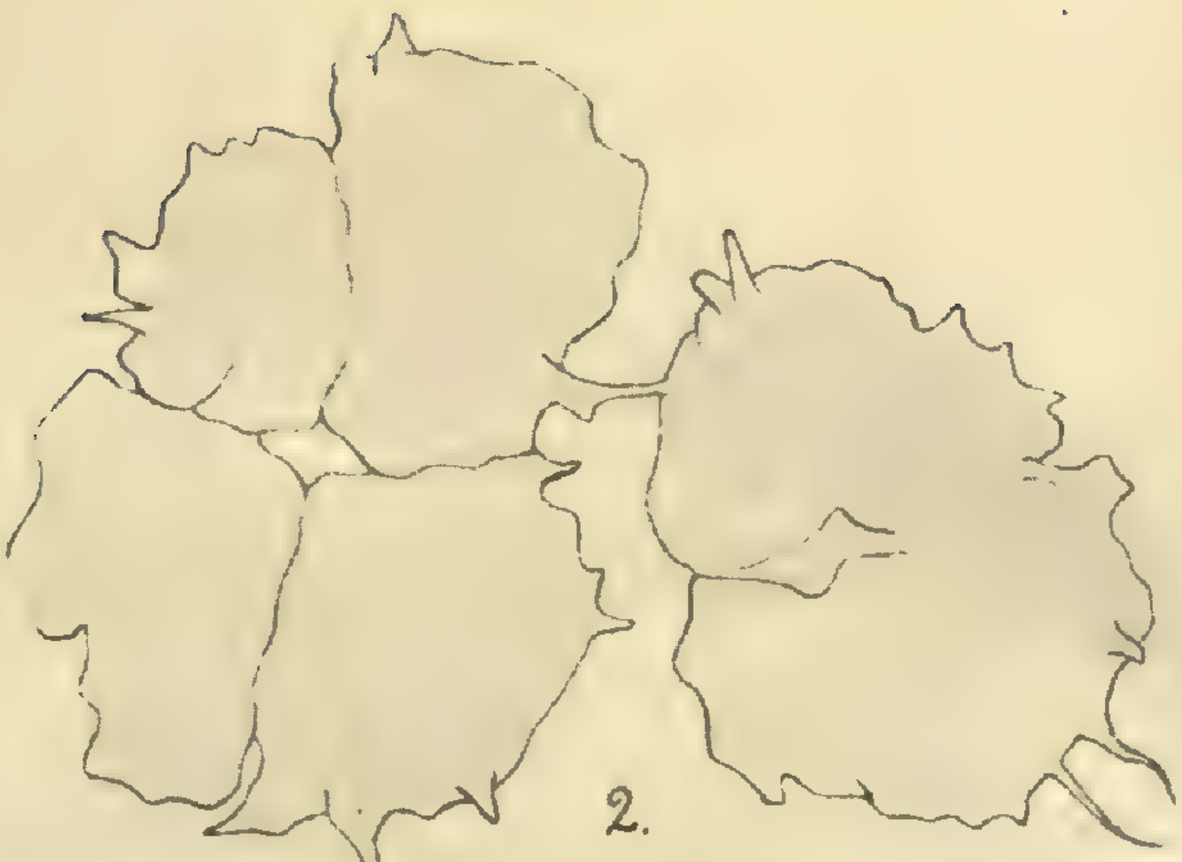
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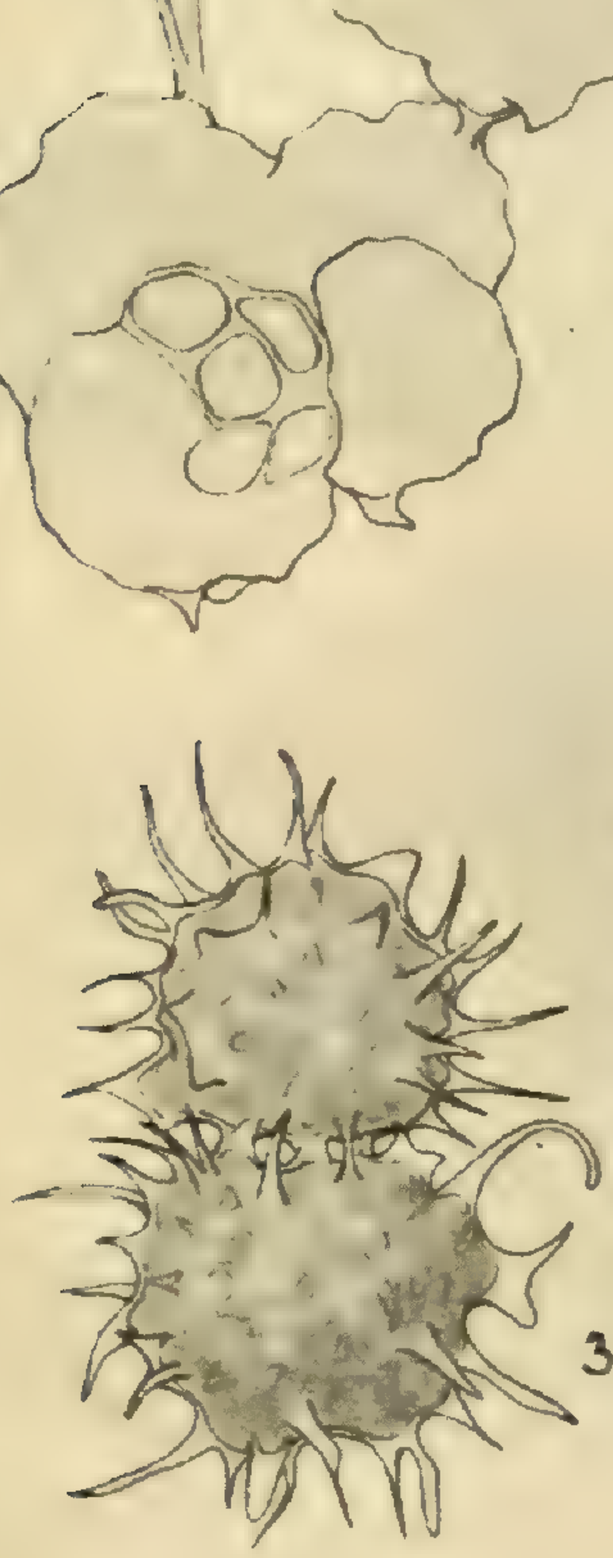
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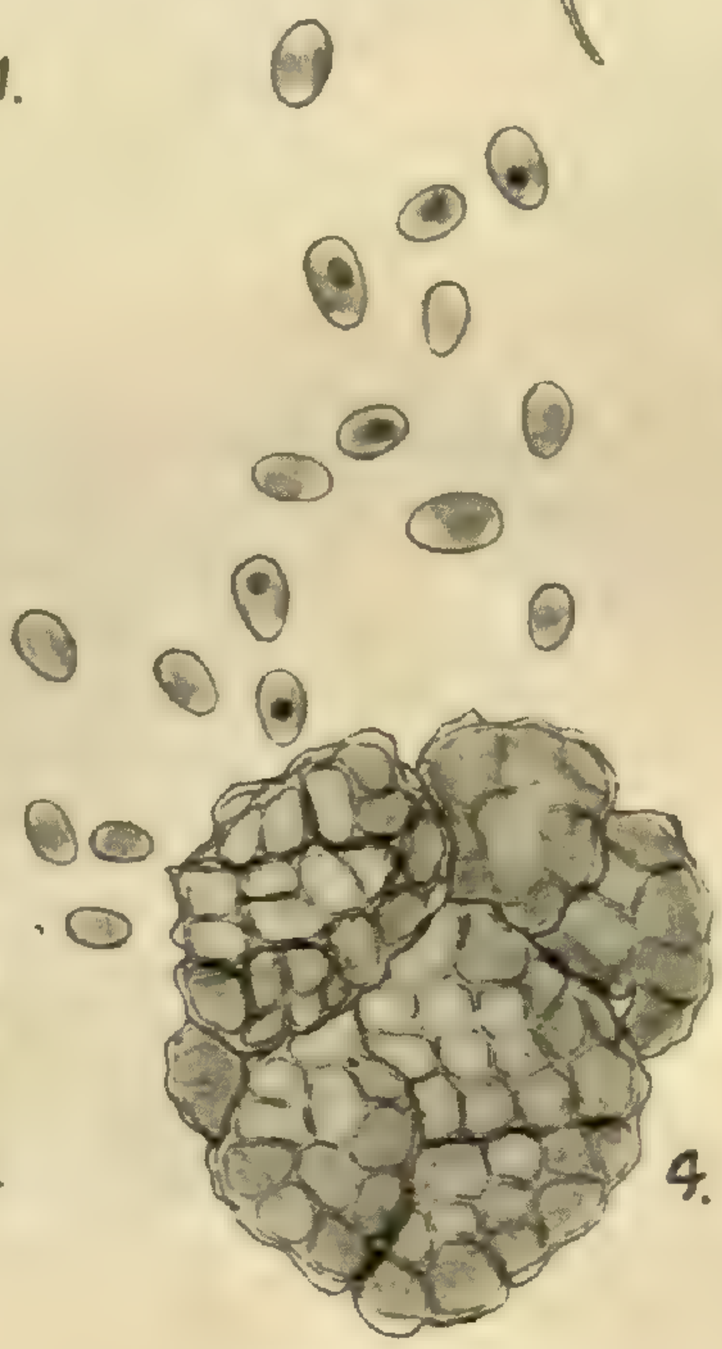
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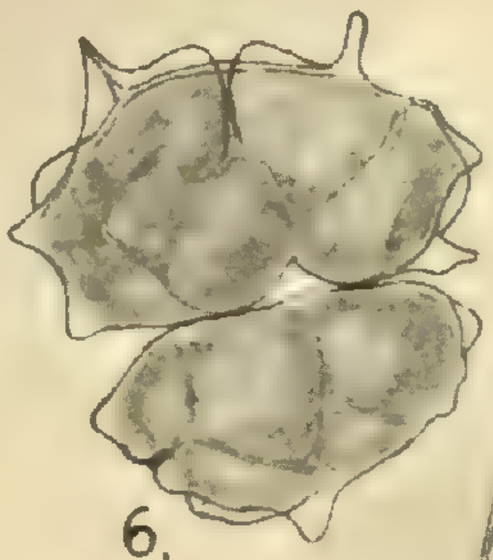
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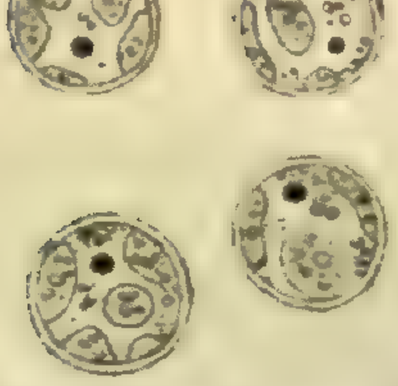
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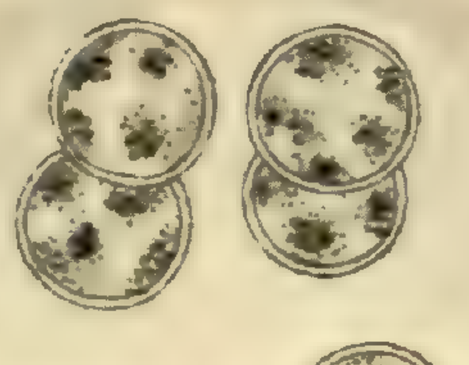
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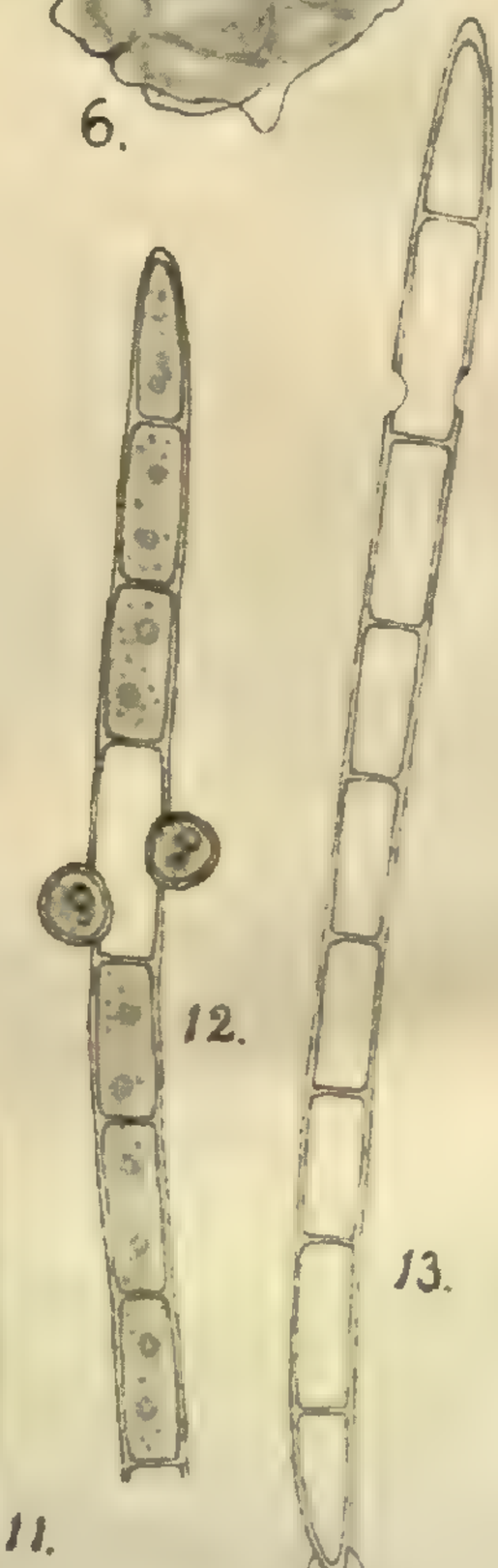
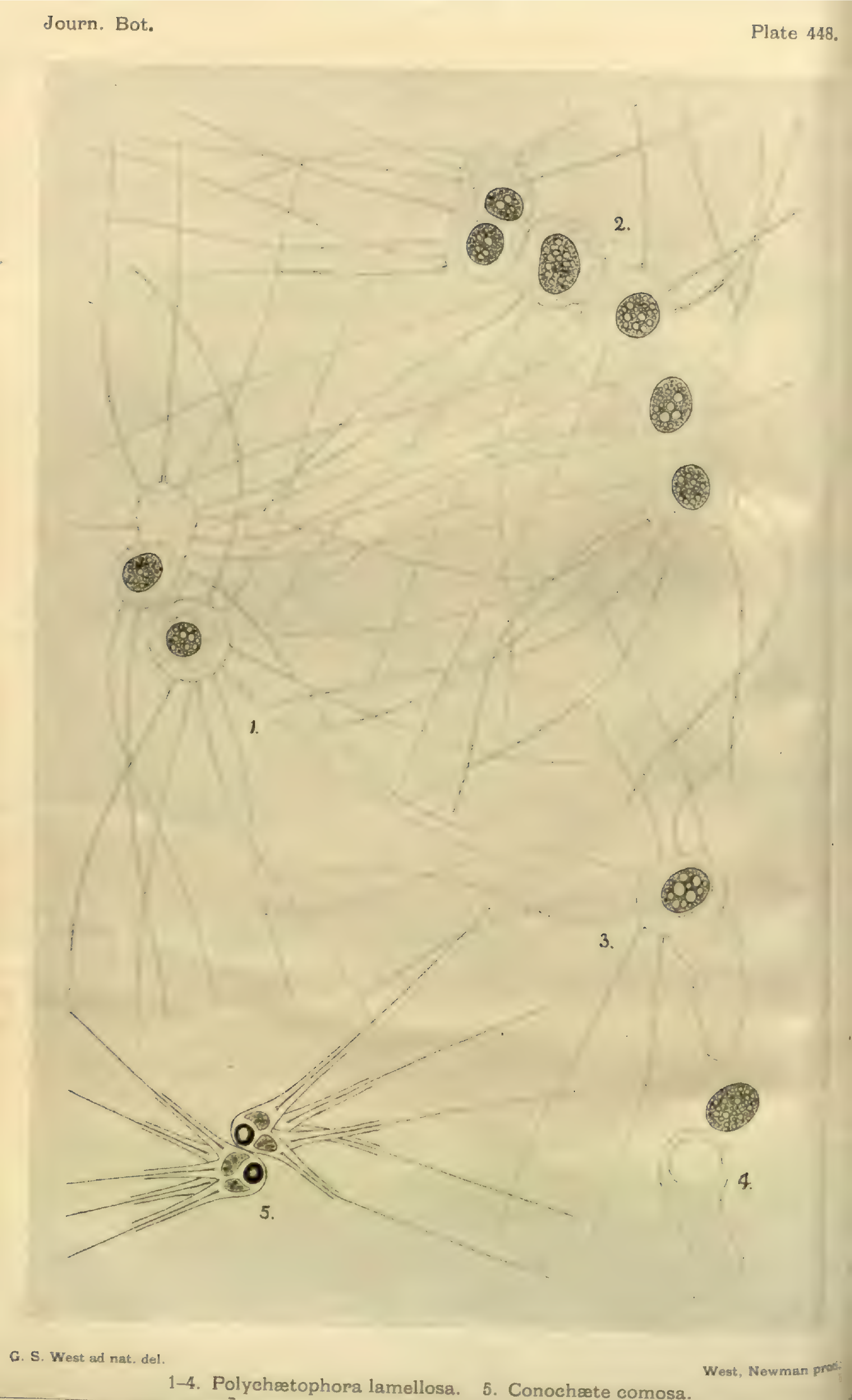

11. 12. 13.

G. S. West ad nat. del. West, Newman proc.

1–6. Ineffigiata neglecta. 7–10. Chlorobotrys regularis.
11–13. Uronema confervicolum.



G. S. West ad nat. del.

West, Newman prob.

1–4. Polychætophora lamellosa. 5. Conochæte comosa.

NOTES ON FRESHWATER ALGÆ.—III.

By W. West, F.L.S., and G. S. West, M.A., F.L.S.

(Plates 446–8.)

The algæ dealt with in this paper are mostly British forms which have come under our notice during the past two years. During this time we have examined a very large amount of material, and have discovered numerous algæ previously unknown for the British Isles. A number of these have had to be placed as new genera and species, the most interesting one being a species of *Debarya*, which we have named *Debarya desmidioides*. This alga is of particular interest on account of the light it throws on the origin of the *Desmidiaceæ*. Three of the algæ have been referred to the following new genera:—*Phæosphæra*, *Pseudochæte*, and *Polychætophora*. We also give figures and a much fuller description of *Ineffigiata neglecta*, an abundant alga to which we called attention in 1897.

During a short visit to the island of St. Mary, Scilly Islands, the following algæ were collected:—*Œdogonium rufescens*, *Œ. cryptoporum* var. *vulgare*, *Œ. inerme*, *Hormiscia subtilis* var. *variabilis*, *Microthamnion Kützingianum*, *Cladophora flavescens*, *Vaucheria sericea*, *Cosmarium tinctum*, *C. Meneghinii*, *Conferva bombycina* forma *minor*, *C. obsoleta*, *Ophiocytium capitatum*, *Nodularia* sp., *Merismopedia punctata*, *Navicula dicephala*, *N. limosa*, *N. oblonga*, *N. peregrina*, *N. Iridis*, *N. Amphisbæna*, *N. viridis*, *Achnanthes coarctata*, *A. linearis*, *Cocconeis Placentula*, *Amphiprora paludosa*, *Gomphonema parvulum*, *Eunotia lunaris*, *Synedra pulchella*, *Nitzschia linearis*, and *N. Palea*. As these are the first records of freshwater algæ from the Scilly Islands, this short list should be of interest.

The most interesting Desmid in this paper is a new subalpine *Staurastrum*—*S. echinodermum*—from 2700 ft. on Glyder Fawr, North Wales.

Rhodophyceæ.

1. Chantransia scotica Kütz. Phyc. gener. 1843, p. 285; Spec. Algar. 1849, p. 430; Fab. Phyc. v. t. 42. Rabenh. Flor. Europ. Algar. iii. 1868, p. 402. Lat. cell. 9·5–10·5 μ. In dark, bluish green or bright red, cæspitose tufts, about 4–5 mm. high.

Hab. Mousehole Cave, Cornwall, in fast running water. Gobbins Cliffs, Co. Antrim, Ireland, in running water on *Hypnum rusciforme*.

2. Sacheria fluviatilis (Ag.) Sirodot in Ann. Sci. Nat. (Bot.) tom. xvi. 1872, p. 70, t. 1, f. 7 *bis*; t. 8, f. 81. *Lemanea fluviatilis* Ag.; Kütz. Spec. Algar. p. 527; Tab. Phyc. vii. t. 82.

Hab. Shipley Glen, W. Yorkshire, in fast stream.

3. S. fucina (Bory) Sirodot, *l. c.* p. 74, t. 8, f. 83. *Lemanea fucina* Bory.

Hab. In cataract, near Giggleswick, and in a torrent at Ingleton, W. Yorkshire.

4. S. MAMILLOSA Sirodot, *l. c.* p. 75, t. 8, f. 84.

Hab. In a rapid stream near Harrogate; in the River Wharfe at Bolton Woods and near Ilkley, W. Yorkshire. Schymel's Bridge, Penzance, Cornwall (leg. O. Nordstedt).

This species is undoubtedly the most widely distributed British alga belonging to the family *Lemaneaceæ*. The extent to which the plants are branched varies considerably in different localities.

5. LEMANEA PARVULA Sirodot, *l. c.* p. 85, t. 5, f. 35–39. Length of fructiferous filaments up to 5 cms. Antheridial areas large, almost confluent.

Hab. Scandale, Westmoreland.

This alga has only previously been observed from "Canal d'Ille-et-Rance, écluse du Haut-Chalet ou Vau-Chalet, près de Betton."

PHÆOPHYCEÆ.

6. **Phæococcus paludosus,** sp. n. P. cellulis parvis, ellipsoideis vel oblongo-ellipsoideis; 2–8-pluribus in tegumento gelatinoso homogeneo et tenuissimo; chromatophoris duobus, flavo-brunneis, parietalibus, in cellula unaquaque; zoogonidiis subglobosis, oblongis vel subpyriformibus, biciliatis, cum macula pigmenti prope basin ciliorum. Diam. cell. 5·7–10·5 μ; long. zoogonid. 8·5–14 μ; lat. zoogonid. 5·5–7·5 μ.

Hab. Eldwick, W. Yorkshire, in small moorland ditches amongst other algæ.

This interesting plant occurred in quantity in April and May, 1902, amongst various species of *Mougeotia* and *Conferva*, in ditches which almost dry up in the summer. The genus was founded by Borzi in 1892 (cfr. Borzi in Atti del Congr. Botan. Internaz. Genova, 1892, pp. 463–471, t. xviii.) to include one species—*P. Clementi* Borzi (= *Protococcus Clementi* Menegh. 1849; *Glœocystis Clementi* Rabenh. 1868). *P. paludosa* is distinguished from *P. Clementi* by its smaller size and more rounded cells, which are embedded in a homogeneous gelatinous integument. The zoogonidia are smaller and more elongate, often being pyriform or conical in form.

Phæosphæra, gen. n.

Cellulæ in tegumentis laxe et sparse aggregatæ; tegumentis gelatinosis, hyalinis, subcylindricis, parce ramosis; cellulis magnis, exacte globosis; chromatophora singula, parietalis, luteo-brunnea, cum margine indistincte lobato; membrana cellularum tenuissima et firma. Propagatio bipartitione cellularum in 3 directiones.

7. **Phæosphæra gelatinosa,** sp. unica. Character idem ac generis. Diam. cell. 14–17·5 μ; diam. integument. 80–200 μ; long. integ. 3–5 mm.

Hab. Tremethick Moor, Cornwall, in *Sphagnum*-bogs.

The specimens of this alga occurred scattered amongst several species of *Œdogonium*, *Zygnema*, and numerous Diatoms and Desmids, in collections made from *Sphagnum cuspidatum* var. *plumosum*. The cells are exactly spherical, and occur in small groups evenly but sparingly scattered through an elongated gelatinous investment.

This integument is quite transparent and colourless, of variable width along its entire length, and it occasionally branches. The cell-walls are firm but very thin. There is one chromatophore present in each cell, and it is of a yellowish-brown colour, precisely similar to the chromatophores of Diatoms. It is parietal, with lobose margins, and occupies about one-half of the internal area of the cell-wall. Numerous minute granules are seen distributed through both the chromatophore and the remainder of the cell-protoplasm. No zoogonidia or other reproductive bodies were observed. The cells multiply in three directions by simple cell-fission.

This alga and *Phæococcus paludosus* are the only known British algæ belonging to the family *Phæocapsaceæ*.

Chlorophyceæ.

8. Coleochæte irregularis Pringsh.

Hab. Capel Curig, N. Wales, on *Lobelia Dortmanna*.

9. Bulbochæte subintermedia Elfv. in Hirn, 'Verzeichnis finländ. Œdog.,' Acta Soc. pro Fauna et Flora Fennica, xi. no. 6, 1895; Hirn, 'Monogr. des Œdog.,' Acta Soc. Scient. Fennicæ, xxvii. p. 332, t. 53, f. 338 (1900).

Crass. cell. veget. 15–21 μ; altit. $2\frac{1}{2}$–4-plo major
,, oogon. 52–55 μ; ,, 43–49 μ;
,, cell. androsp. 14·5–16 μ; ,, 11–12·5 μ;
,, nannandr. 8·6–10·6 μ; ,, 26–27 μ.

Hab. Near Senens, Cornwall.

The plants observed bear considerable resemblance to *B. intermedia* De Bary, but the dissepiments of the supporting cells were all a little above the middle, and the oogonia were proportionately larger than in that species. The oogonia were usually situated under a terminal bristle, and the androsporangia were scattered and 1–2-celled.

10. Œdogonium rufescens Wittr. in Öfvers. af K. Vet.-Akad. Förh. 1870, no. 3, p. 134; Hirn, 'Monogr. des Œdog.,' Acta Soc. Scient. Fennicæ, xxvii. p. 76, t. 1, f. 4 (1900). Forma oogoniis 1–4 (plerumque 2) continuis (cfr. Hirn, *l. c.* p. 77).

Crass. cell. veget. fem. 9·5–12·5 μ; altit. 5–6-plo major;
,, ,, ,, masc. 7·6–9 μ; ,, 7–8-plo ,,
,, oogon. 24–26 μ; ,, 24–34·5 μ;
,, oospor. 22–24 μ; ,, 17–18 μ;
,, antherid. 6 μ; ,, 9·6–10·5 μ.

Hab. St. Mary's, Scilly Islands, in great abundance.

11. Œ. inerme Hirn, *l.c.* p. 287, t. 2, f. 10.

Crass. cell. veget. 13–13·5 μ; altit. 7-plo major;
,, oogon. 37–38 μ; ,, 34·5–40 μ;
,, oospor. 35·5–37·5 μ; ,, 28·5–29 μ.

Hab. St. Mary's, Scilly Islands, amongst the preceding species, but not so abundant.

12. Œ. zig-zag Cleve in Wittr. 'Dispos. Œdog. Suec.,' Ofvers. af K. Vet.-Akad. Förh. no. 3, 1870, p. 120; Hirn, *l. c.* p. 101, t. 7, f. 42.

Var. ROBUSTUM, var. n. (*Œ. zig-zag* forma West & G. S. West in Journ. Roy. Micr. Soc. 1897, p. 472.) Var. filis longioribus pluricellularibus, cellulis leviter crassioribus; antheridiis bicellularibus.

Crass. cell. veget. 19–23 μ; altit. 2–4-plo major;
,, oogon. 53–58 μ; ,, 50–56 μ;
,, oospor. 51–56 μ; ,, 47–53 μ;
,, cell. antherid. 19 μ; ,, 5·5–6·5 μ.

Hab. Harefield, Middlesex.

In his monograph of the *Œdogoniaceæ*, Hirn states that the plants of *Œ. zig-zag* Cleve are always short, and consist of very few cells; the antheridia are, moreover, unicellular. The Middlesex plants were slightly thicker, with much longer filaments and constantly 2-celled antheridia.

13. Œ. BORISIANUM (Le Cl.) Wittr., *l. c.* 1870, p. 132; Hirn, *l. c.* p. 217, t. 36, f. 223. *Prolifera Borisiana* Le Clerc, 1817.

Crass. cell. veget. 17–19 μ; altit. 8–9½-plo major;
,, ,, suffult. 31–42 μ; ,, 3½–4-plo ,,
,, oogon. 53–59·5 μ; ,, 67–88 μ;
,, oospor. 49–58 μ; ,, 49–58 μ;
,, antherid. 17 μ: ,, 12·5–13 μ.

Hab. Near Senens, Cornwall; abundant amongst *Œ. Boscii* (Le Cl.) Wittr. and *Œ. ciliatum* (Hass.) Pringsh.

Many of the oogonia were terminal.

14. Œ. DECIPIENS Wittr. *l. c.* 1870, p. 126; Hirn, *l. c.* p. 266, t. 46, f. 283.

Crass. cell. veget. 10–12 μ; altit. 5–7-plo major;
,, oogon. 33–35 μ; ,, 32·5–38 μ;
,, oospor. 31–32·5 μ; ,, 24–26 μ;
,, antherid. 9 μ; ,, 9·5–12 μ;
,, nannandr. 6·7 μ; ,, 7 μ.

Hab. Near Senens, Cornwall; amongst *Œ. ciliatum* (Hass.) Pringsh.

15. **Monostroma membranacea**, sp. n. M. thallo membranaceo, expanso et lubrico, pallide viridi, margine plerumque laciniato; cellulis subquadratis vel polygonis, confertis, in sectione thalli transversa verticaliter suboblongis; chromatophoris parietalibus, singulis, cum pyrenoide singulo. Long. thall. usque ad 8 cm.; crass. thall. 18 μ; diam. cell. 8–20 μ.

Hab. Mitcham Common, Surrey, in ponds.

This plant differs from other freshwater species of *Monostroma* in its closely compact polygonal cells, forming a broad expansive thallus which reaches a length of eight or nine centimetres. The thallus is attenuated towards the base, which in young plants is fixed, and the margins of the thallus are frequently much torn. The cells are sometimes more or less quadrate, and are disposed fairly regularly, but more often they are polygonal, compact, and have no regular arrangement. In a transverse section of the thallus the cells are more or less oblong, with their long axis vertically disposed. There is a single parietal chromatophore in each cell, usually covering a large part of the interior of the cell-wall, and it contains one pyrenoid.

On the conversion of an ordinary vegetative cell into a gametangium, the cell-contents divide into eight portions, and ultimately eight biciliated, isogamous gametes are liberated. The conjugation of these gametes is a slow process, and after the complete fusion of the pair of gametes the zygospore still swims about with its two pairs of cilia. The zygospores come to rest, and after losing their cilia and acquiring a strong cell-wall, so far as was observed, formed resting-spores or *hypnospores*. None were observed to germinate directly. The hypnospores germinated after several weeks, dividing first into four cells, but afterwards the division was irregular. The pyrenoids were most conspicuous in the young plants.

16. Uronema confervicolum Lagerh. in Malpighia, 1887, p. 518, t. xii. f. 1–10. Crass. fil. 5–6 μ. (Pl. 447, figs. 11–18.)

Hab. Esher Common, Surrey.

This genus of *Ulotrichaceæ* has not previously been observed from Britain. The filaments are relatively short, and both the apical and basal cells are attenuated, the latter secreting an adhesive disc. The chromatophore is parietal with two pyrenoids, but in the specimens observed it was rather difficult to clearly define. The zoogonidia were not observed, although empty cells were seen from which they had escaped.

One instance was observed of the formation of globular aplanospores. *Two* of these were formed from each cell, and were provided with strong cell-walls. They appeared to have arisen from zoogonidia which had been arrested in their exit from the cells.

Pseudochæte, gen. n.

Thallus filamentosus, ramosus, e ramis repentibus et ramis erectis attenuatis formatus; cellulis ramorum repentum subcylindricis, subquadratis vel doliformibus, diametro 1–2-plo longioribus, cum chromatophoris singulis parietalibus et pyrenoidibus singulis; cellulis ramorum erectorum angustioribus, cylindricis vel cylindrico-fusiformibus, diametro 7–18-plo longioribus, cum chromatophoris singulis parietalibus, cellulis terminalibus attenuatis vel acutissime attenuatis sæpe sine chromatophoris.

17. **Pseudochæte gracilis**, sp. n. Cellulæ ramorum repentum curtæ, diametro circiter 1–1¼-plo longiores; ramis erectis gracilibus, cellulis diametro 12–18-plo longioribus. Diam. cell. ram. repent. 5·7–7·7 μ; diam. cell. ram. erect. 1·5–1·8 μ.

Hab. Near Coates, Gloucestershire.

This genus bears considerable resemblance to *Aphanochæte* A. Br. (et Berth.), but differs in the possession of true septate branches instead of simple bristles. These erect branches consist of several (5 to 8) distinct cells, most of which possess well-marked chromatophores. The latter are parietal and somewhat elongated, and are sometimes absent from the terminal cells of the branches.

The genus belongs to the *Chætophoraceæ* on account of its branched, completely septate thallus, the cells of which possess parietal chromatophores.

The only other species of the genus is one from Ceylon, which

has been described under the name of *Herposteiron crassisetum*. This will now stand as follows:—

P. CRASSISETA nob. (*Herposteiron crassisetum* West & G. S. West in Trans. Linn. Soc. (Bot.) vi. p. 130, t. 17, f. 11 (1902)). Cellulæ ramorum repentum cylindrico-fusiformes vel doliformes, diametro $1\frac{1}{2}$–$2\frac{1}{4}$-plo longiores; ramis erectis crassis, cellulis 7–10-plo longioribus. Diam. cell. ram. repent. 6·5–7·5 μ; diam. cell. ram. erect. 2·3–5 μ.

Hab. Heneratgod'ha, Ceylon.

18. **Thamniochæte aculeata**, sp. n. Thallus minutus, curtus, e cellulis 3–4 formatus; cellula basali in haptero singulo producta; cellulis intermediis (1–2) cylindricis vel subcylindricis; cellula apicali magna et inflata, seta brevi acuta singula subterminali instructa. Diam. cell. intermed. 5·5 μ; diam. cell. apical. 10–13 μ; long. set. 25–31 μ.

Hab. Baheli Lough, Co. Galway, Ireland. Also from near Balallan, Lewis, Outer Hebrides.

This genus was first established by Gay (in Bull. Soc. Bot. France, tom. xl. 1893, p. clxxvii, cum fig. xylogr. 2) to include a small epiphytic member of the *Chætophoraceæ*, consisting of very few cells, which he named *Thamniochæte Huberi*.

The plants we have found from the western hilly portions of Connemara and the Hebrides constitute another species of the genus. The British species is characterized by its fewer cells, which are more cylindrical, by its large swollen terminal cell and its subterminal bristle. There is a small organ of attachment, or hapteron, developed from the basal cell. Gay's plant—*T. Huberi*—was an epiphyte on the filaments of an *Oscillatoria*; *T. aculeata* was epiphytic on the thallus of *Glœotrichia*.

Thamniochæte is the smallest and most imperfectly developed of the genera of the *Chætophoraceæ*.

19. GONGROSIRA VIRIDIS Kütz. *Stereococcus viridis* Kütz. in Linnæa, 1833, p. 379. *G. Sclerococcus* Kütz. in Phycol. gener. 1843, p. 283; Rabenh. Flor. Europ. Algar. 1868, iii. p. 387. Diam. cell. 7·7–12 μ.

Hab. On rocks, near Tremethick, Cornwall.

This plant is known elsewhere in the British Islands from rocks on the shores of Lough Beg, Co. Londonderry, Ireland. Cfr. West & G. S. West in Trans. Roy. Irish Acad. xxxii. sect. B, part 1, 1902, p. 16.

20. CHÆTONELLA GOETZEI Schmidle in Engl. Bot. Jahrbüch. xxx. 1901, p. 253, t. v. f. 1, 2. Crass. cell. plerumque 5·5–6 (usque ad 7·7) μ; crass. cell. termin. 1·5–2 μ.

Hab. Cowside Beck, near Arncliffe, W. Yorkshire; epiphytic on *Spirogyra* sp.

This small alga is a member of the family *Cladophoraceæ* on account of the incompletely septate nature of the thallus, each segment of which contains several nuclei. It has been previously found only in Equatorial Africa.

21. MOUGEOTIA GELATINOSA Wittr. in Wittr. & Nordst. Alg.

Exsic. no. 957, 1889; descript. p. 26. Crass. cell. veget. 11·5–12·5 μ; diam. spor. min. 27–33 μ, max. 34·5–43 μ; crass. strat. ext. gelat. 7–8·5 μ.

Hab. In ditches near the Lizard, Cornwall. Also Llyn Geirionedd, N. Wales.

These examples were rather less than Wittrock's original Swedish specimens, but otherwise were precisely similar. We have previously recorded this alga from Scotland (Journ. Bot. 1893, p. 98).

22. M. ELEGANTULA Wittr. in Bih. till K. Sven. Vet.-Akad. Handl. Bd. 1, no. 1, 1872, p. 40, t. 3, f. 5–8.

Hab. Llyn-y-cwm-ffynon, N. Wales.

23. **Debarya desmidioides,** sp. n. (Pl. 446, figs. 1–9.) Fila longa, flexuosa, facile dissociata, ad genicula multe constricta; cellulis vegetativis cylindricis, diametro $2\frac{1}{2}$–$6\frac{1}{2}$-plo longioribus, apicibus rotundo-truncatis, pyrenoidibus 2 in chloroplastida singula; zygosporis rotundo-quadratis, lateribus rectis vel levissime retusis. Conjugatio post dissociationem filorum in cellulis singulis. Long. cell. 25–50 μ; lat. cell. 7·7–8·6 μ; diam. zygosp. 21–25 μ.

Hab. In a small stream near the Lizard, Cornwall.

This remarkable plant is the most fragile of any of the described algæ belonging to the subfamily *Zygnemeæ*. The filaments break up into individual cells most readily, and conjugation only occurs between a pair of isolated cells. The solitary chloroplastid, which usually extends from one pole of the cell to the other, and contains two pyrenoids, is sometimes restricted to the equatorial region of the cell, but at the same time retains a more or less compressed character. When in filaments there is a most evident constriction between the cells, and the whole filament is sheathed in a somewhat conspicuous gelatinous envelope. Conjugation is exactly as in other species of *Debarya*, but, owing to the previous dissociation of the filaments, the plants have a most striking resemblance to certain of the *Desmidiaceæ*. In fact, this plant seems to be one of the algæ through which the gradual descent of the *Desmidiaceæ* has taken place. It has been well proved that the Desmids are a degenerate family of the *Conjugatæ*, and no form of the *Zygnemaceæ* has been met with which illustrates this degeneracy better than *Debarya desmidioides*. It is one of those algæ which add a still stronger link to the chain of evidence which goes to prove that the family *Desmidiaceæ* is a degenerate group of the *Conjugatæ*, and that the group has arisen by a loss of the filamentous condition and a degeneration of sexual characters, accompanied by an increase of morphological complexity. It fills up the link that was missing in the scheme of evolution of the genera of Desmids that has already been advocated (cfr. G. S. West, 'On Variation in the *Desmidieæ* and its Bearings on their Classification,' Journ. Linn. Soc. (Bot.) xxvii. 1899, p. 414) by indicating clearly the origin of the genera *Mesotænium* and *Cylindrocystis* from ancestral filamentous Conjugates.

The formation of the zygospore in *D. desmidioides* takes place

exactly as in *D. glyptosperma*, but the shortness of the cells and the absence of the filamentous condition recall very much the conjugation in the genus *Cylindrocystis*. When approaching maturity the zygospore still has attached to it the four halves of the two gametangia, and these four half-cells acquire that remarkable appearance of solidity which is such a striking feature in the conjugation of *D. glyptosperma* (cfr. Ann. Bot. vol. xii. p. 49, 1898). The mature zygospore appears to possess four "solid" processes, each being a metamorphosed half-cell of the two gametangia. This is exactly the appearance which is most conspicuous in the conjugation of *D. glyptosperma*, and which, apart from other characters, would be sufficient to place this alga in the genus *Debarya*.

24. Zygnema Vaucherii Ag. var. stagnale (Hass.) Kirchn. Crass. fil. 11·5–13 μ; long. zygosp. 28–29 μ; lat. zygosp. 15·3–16·3 μ.

Hab. Near the Lizard, Cornwall.

The vegetative cells were 5–7 times longer than their diameter, and the fructiferous cells were slightly swollen. The zygospores had the appearance of being arranged in pairs owing to their position towards the contiguous ends of every pair of fructiferous cells.

25. Genicularia spirotænia De Bary. Long. cell. 270–355 μ; lat. cell. in med. 23–25 μ, ad apic. 27–29 μ; diam. zygosp. 54–57 μ.

Hab. Hayle Pool, about four miles from the Lizard, Cornwall.

This rare Desmid has been observed from Cornwall once before, but is not known from any other part of the British Islands. In the specimens seen there were two large spiral chloroplastids with irregular margins and large pyrenoids, each chloroplastid making from $5\frac{1}{2}$ to $7\frac{1}{2}$ turns.

Genicularia is the rarest of all the genera of Desmids.

26. Spirotænia minuta Thur. *Hab.* Llyn Idwal, N. Wales.

27. S. parvula Arch. *Hab.* Glyder Fach, N. Wales, at 2200 ft.

28. Mesotænium Endlicherianum Näg.

Hab. Bog below Llyn Idwal; Glyder Fach, at 2200 ft., N. Wales.

Var. grande Nordst. *Hab.* Capel Curig, N. Wales.

29. M. mirificum Arch. *Hab.* Llyn Idwal, N. Wales.

30. Penium Libellula (Focke) Nordst. var. intermedium Roy et Biss. *Hab.* Bog above the lakes at Capel Curig; Llyn Idwal, N. Wales.

31. Netrium Nägelii (Bréb.) nob. *Hab.* Moel Siabod, N. Wales.

32. N. oblongum (De Bary) Lütkem. var. cylindricum, var. n. (Pl. 446, fig. 10.) Var. cellulis minoribus et exacte cylindricis; polis hemisphæricis; chromatophoris ut in forma typica. Long. 57–73 μ; lat. 17–18·5 μ.

Hab. Bog above the lakes at Capel Curig, Moel Siabod, Llyn Idwal, Llyn Cwlyd, Llyn Gwynant, N. Wales; Helvellyn, Westmoreland.

This variety is often abundant in the boggy portions of upland moors, round the margins of lakes, &c., frequently occurring mixed with the typical plants. It is distinguished from the latter by its

smaller size, and by its exactly cylindrical cells with parallel lateral margins.

33. **Roya cambrica**, sp. n. (Pl. 446, fig. 11). R. submagna, cylindrica, diametro circiter 25–26-plo longior, leviter curvata, apicibus subtruncatis vix angustatis; pyrenoidibus 6–7 in semicellula unaquaque; membrana glabra. Long. 173–177 μ; lat. 6·2–6·7 μ; lat. apic. 4·6–4·8 μ.

Hab. Llyn Ogwen and Llyn Cwlyd, N. Wales.

This is the third known species of the genus, and to us affords still further evidence of the distinctness of the genus *Roya*. All species of the genus *Closterium* possess two chloroplastids in each cell, whereas species of the genus *Roya* only possess one chloroplastid, the nucleus being lodged in a lateral excavation of it near the centre of the cell. In *R. cambrica*, as in the other species of the genus, there was no trace of an apical vacuole with moving corpuscles, and the chloroplastid extended almost to the extreme poles of the cell. The terminations of the chloroplastid at each pole are convex, whereas in *Closterium* they are almost always concave on account of the presence of the apical vacuoles.

34. Closterium abruptum West. *Hab.* Capel Curig; Glyder Fach, at 2200 ft.; Llyn-y-cwm-ffynon, N. Wales.

(To be concluded.)

SOUTH HANTS LOCALITIES.

By E. F. Linton, M.A.

The following notes have been accumulating during recent years. If they are not very numerous, it is because my walks have been chiefly confined to such portions of Districts I., II., and III. as lie within a radius of twelve miles from Bournemouth; and the results within this limit have all (or nearly all) been published in my *Flora of Bournemouth*. The figures refer to the districts in Mr. Townsend's *Flora of Hampshire*, and the localities given are additional to those in the Flora, though it is likely that some of them may occur in one or other of the numerous papers on Hants plants since published in this Journal or elsewhere.

Ranunculus intermedius Knaf. III (1). Shallow ditch by path crossing the common N.W. of Brockenhurst; detected by the Rev. W. R. Linton in my company, and seen more than one season.—*R. sardous* Crantz. III (1). In plenty on a small green by a farm about two miles N.N.E. of Brockenhurst; a dwarf form, much of which would be classed as var. *parvulus* (L.), which I take to be a state rather than a variety.

Castalia speciosa Salisb. I. "In the Bourne: *Trimen*." Not seen in the lower part of the stream, which is in Hants; but it occurs in the Coy Pond, through which the stream flows, and about half a mile higher up, just outside Bournemouth, but in Dorset.

Papaver dubium L. var. *Lecoqii* (Lamotte). IV (1). Wellow.

Glaucium flavum Crantz. III (1). Milford to Hurst Castle, on shingle, reaching three feet high.

Fumaria muralis Sond. I still consider the plant published in *Fl. Bournemouth* to be this species, by Mr. Pugsley's Key.—*F. densiflora* DC. XI. Odiham.

Arabis hirsuta Scop. var. *glabrata* Syme. IV (2). Ningwood.

Diplotaxis muralis DC. VIII (3). Porchester.

Lepidium ruderale L. III (1). On a chicken-run, with two aliens; no doubt introduced.

Polygala calcarea F. Schultz. II. Mizaze Hill; frequently white.

Frankenia lævis L. IV (1). Reported in the Fl. Hants as extinct at the locality in this subdistrict. A specimen, however, reached me, attached to the soil about the roots of some *Orobanche Pieridis* sent me from near Freshwater alive by the late Capt. Steuart in 1892; this was nine years after its reported extinction in Fl. Hants.

Dianthus Armeria L. III (1). A single plant in a new gravel road, Milton, was shown me by the Rev. J. E. Kelsall.

Silene anglica L. IV (1). Freshwater.—*S. noctiflora* L. II. Edge of cultivated land on Breamore Down. Very rare in the county.

Althæa officinalis L. II. Given for "Mudeford, 1860; *Tate*," in Fl. Hants. There are now three or four very strong clumps, at Stanpit, halfway between Christchurch and Mudeford, which have probably only recently become conspicuous.

Malva pusilla Sm. III (1). Keyhaven; casual. VIII (3). Porchester.

Rhamnus catharticus L. II. Breamore.

Trifolium procumbens L. var. *majus* Koch. II. Chalky field, Breamore Down.

Lotus tenuis Waldst. & Kit. IV (1). Near Newbridge.

Hippocrepis comosa L. II. Mizaze Hill, Breamore Down.

Onobrychis viciæfolia Scop. II. By Breamore Wood, a native locality; on chalk.

Vicia gracilis Loisel. IV (1). In quantity on a field, Tapnell Farm, Wellow.

Lathyrus Nissolia L. V (2). Sandown to Yaverland, bank near the shore.—*L. sylvestris* L. II. Breamore Wood.

Rubus fissus Lindl. III (1). Wootton enclosure; probably the same species as that recorded by Wise in *The New Forest*, ed. 2, as *R. suberectus*.—*R. plicatus* W. & N. III (1). Denny Bog.—*R. integribasis* P. J. Muell. III (1). Ober Water, Brockenhurst, *W. R. Linton*.—*R. leucostachys* Schleich. II. Breamore.—*R. villicaulis* var. *Selmeri* Lindeb. III (1). Ober Water, Brockenhurst, *W. R. Linton*.—*R. Bloxamii* Lees. Much commoner in Districts I, II and III (1) than the Fl. Hants would lead one to suppose. II. Godshill; Breamore Wood.—*R. echinatus* Lindl. II. Breamore Wood, very fine.—*R. adornatus* P. J. Muell. III (1). Near Royden Farm, Brockenhurst.—*R. Bellardi* W. & N. II. Breamore Wood; given as *R. rotundifolius* Blox. (under *R. hirtus*) in Fl. Hants.—*R. cæsius* × *Idæus*. II. Rather abundant round one or two thickets on

Mizaze Hill, Breamore. There is another cæsian hybrid on the same hill.

Geum rivale L. II. Just south of Fordingbridge Station, in both Hants and Dorset.

Poterium polygamum Waldst. & Kit. IV (1). South of Ningwood.

Rosa sepium Thuill. II. Mizaze Hill, Breamore; new to Hants when first published. Rather plentiful.—*R. micrantha* Sm. II. Breamore Down, near Mizaze Hill.—*R. obtusifolia* Desv. var. *frondosa* Steven. XI. Basingstoke.—*R. stylosa* var. *systyla* (Bast.). IV (2). Newtown. IV (3). Carisbrook.

Pyrus Aria Ehrh. II. Mizaze Hill.

Epilobium obscurum Schreb. IV (1). Near Yarmouth.

Ludwigia apetala Wallr. III (1). Two localities have been detected since the Fl. Hants was issued, roughly speaking, east and west of Lyndhurst; and in both I have seen a fairly strong growth in the last few years.

Smyrnium Olusatrum L. III (1). Milford.

Bupleurum tenuissimum L. III (1). Halfway between Lymington and Keyhaven. IV (1). Just across the estuary from Yarmouth. VIII (3). Porchester.

Petroselinum segetum Benth. & Hook. fil. IV (2). Ningwood; Newtown.

Sison Amomum L. IV (2). Newtown; Shalfleet.

Pimpinella Saxifraga L. II. Breamore; Ellingham. No record for II in Fl. Hants.

Valerianella rimosa Bast. IV (1). Ningwood to Tapnell Farm. —*V. dentata* Poll. var. *mixta* Dufr. II. Field, Breamore Down. IV (1). Ningwood to Tapnell Farm.

Filago spathulata Presl. Yarmouth, near the station; also more plentifully south of Wellow.

Senecio campestris DC. II. Abundant on one restricted part of Breamore Down. Not recorded in Fl. Hants for this or the adjoining districts, in which perhaps there is no other suitable locality for this species.

Arctium majus Bernh. IV (2). Near Shalfleet.

Cnicus arvensis Hoffm. var. *mitis* Koch. VII (2). In some quantity over a piece of arable land about a quarter of a mile S. to S.W. of Milbrook new church.

Centaurea Cyanus L. IV (1). Ningwood to Tapnell Farm. IV (2). Newtown to Calbourne.

Cichorium Intybus L. IV (1). South of Ningwood.

Arnoseris pusilla Gærtn. I. Moordown, not far from the county boundary.

Picris hieracioides L. IV (1). Near Wellow, a dwarf form.

Campanula glomerata L. II. Breamore Wood; rare in this district.

Specularia hybrida A. DC. II. Breamore Down.

Calluna Erica DC. III (1). Var. *incana* auct. North-west of Brockenhurst. Not a very distinct variety, some forms being more and some less hoary.

Centunculus minimus L. III (1). Pennington Common.

Gentiana campestris L. II. Breamore Down; the only place in the whole district where I have seen this species.

Cuscuta Trifolii Bab. IV (2). Near Ningwood.

Hyoscyamus niger L. VII (2). About the butts, Milbrook.

Orobanche elatior Sutton. XI. Near Odiham.

Mentha rotundifolia Huds. III (1). About one mile to the S.W. of Lymington.—*M. rubra* Sm. IV (2). By a rill between Shalfleet and Newbridge; possibly carried down the streamlet from a farm.

Salvia Verbenaca L. IV (2). Shalfleet.

Galeopsis angustifolia Ehrh. II. Breamore. IV (2). Newtown to Calbourne.

Amaranthus retroflexus L. IV (1). Thorley, on a heap of earth in a cultivated field.

Chenopodium ficifolium L. VIII (3). Porchester, with two or three clear casuals.—*C. murale* L. III (1). Keyhaven. VI (2). Totton.

Atriplex laciniata L. I. Abundant and increasing; on the spit at the mouth of the Avon, opposite Mudeford.

Salicornia herbacea L. var. *ramosissima* Woods. III (1). Just east of Lymington, and also towards Keyhaven. IV (2). North of Shalfleet.—Var. *pusilla* Woods. III (1). Keyhaven.—*S. appressa* Dumort. III (1). Keyhaven Marshes, in plenty. VII (2). Weston.

Suæda maritima Dum. var. *procumbens* Syme. III (1). Milford, towards Hurst Castle.

Salsola Kali L. IV (1). Norton Spit, near Yarmouth.

Polygonum maritimum L. I and II. Either I have overlooked this, or it has greatly increased the last year or two. There were several plants both sides of the estuary, *i.e.* in both districts, in 1901, and I have seen plants this year on my only visit to the spot. *P. mite* Schrank. II. Godshill.

Carpinus Betulus L. IV (2). Near Shalfleet.

S. triandra L. II. Breamore, osier-beds. — Var. *Hoffmanniana* (Sm.). VII (2). Along the line, north of Eastleigh Station. XI. Hartley Wintney; male as usual.—*S. alba* L., f. *cærulea* (Sm.). II. Breamore. IV (2). Shalfleet.—Var. *vitellina* L. IV (2). Ningwood.—*S. viminalis* L. II. Godshill to Breamore. — *S. purpurea* L. II. Breamore, a broad-leaved form.

Spiranthes autumnalis Rich. III (1). Pennington Common.

Orchis incarnata L. III (1). Denny Bog. — *O. latifolia* × *maculata*. XI. Growing with both parents in a marsh by the Bidden Water, near Odiham.

Habenaria viridis R. Br. II. Breamore Down, 1891. Not given in the *Flora of Hampshire* for Districts I, II, or III.

Iris Pseudacorus L. XI. By the Bidden Water; the type, which in my experience is a rare form.

Juncus diffusus Hoppe. III (2). Pilewell, east of Lymington.—*J. obtusiflorus* Ehrh. III (2). South side of Sowley Pond. IV (1). Clay cliffs, Totland Bay.

Sparganium neglectum Beeby. III (1). Between Brockenhurst and Lyndhurst. IV (2). Stream just above Shalfleet and at intervals southwards.—*S. simplex* L. II. Breamore.—*S. minimum* Fr. III (1). Pennington Common.

Butomus umbellatus L. II. Near Fordingbridge.

Triglochin palustre L. II. Breamore.

Zostera nana Roth. III (1) and (2). Lymington (very fine and fruiting freely) to Exbury.

Eleocharis multicaulis Sm. I. "Common on all the heaths west of Bournemouth."—Fl. Hants. This remark, occurring rather frequently in Mr. Townsend's Flora, is now seldom correct, as the heaths on the Hants side of the border are much built over, and plants that haunt moist heath or wet bogs are only to be found over the county boundary, in Dorset.

Scirpus pauciflorus Lightf. III (2). Bog near Ashurst Lodge. *S. lacustris* L. II. About Fordingbridge, in the Avon.—*S. Caricis* Retz. XI. By the Whitewater, Odiham.

Rhyncospora fusca R. & S. III (2). Abundantly in bogs half to one mile S. and S.W. of Lyndhurst Road Station.—*R. alba* Vahl. I. See observation under *Eleocharis multicaulis*.

Carex divisa Huds. IV (2). By the Newtown Saltpans.—*C. disticha* Huds. XI. Abundantly in a marsh by the Bidden Water, and also by the canal, near Odiham.—*C. paniculata* L. XI. Greywell, near Odiham.—*C. remota* L. XI. Haseley Common, near Winchfield.—*C. ovalis* Good. XI. About Odiham.—*C. acuta* L. II. By the Avon above Christchurch, and north of Fordingbridge. *C. montana* L. III (1). Not only as given in the Flora, but also by the bridle-path from Brockenhurst to Roydon Farm, and on the way to Denny Bog.—*C. pilulifera* L. XI. Heaths about Odiham. *C. distans* L. XI. By the Whitewater, Odiham.—*C. Pseudocyperus* L. III (1). Pennington Common. (2). By Sowley Pond.—*C. riparia* and *C. rostrata* Stokes. XI. Greywell, Odiham, to which I was taken by Miss C. E. Palmer.

Setaria viridis Beauv. VI (2). Totton. VIII (3). Porchester.

Spartina Townsendi H. & J. Groves. III (1). Between Milford and Hurst Castle; estuary near Lymington Pier Station.

Milium effusum L. II. Breamore Wood.

Gastridium australe Beauv. III (2). West end of Sowley Pond. IV (2). Near Shalfleet (1894).

Avena pubescens Huds. II. By Breamore Wood.

Melica uniflora Retz. Abundant by Breamore Wood.

Poa nemoralis L. II. Breamore Wood, and in the lane just south of the wood.

Festuca elatior L. II. By the mill north of Fordingbridge.

Bromus giganteus L. II. Breamore Wood.

Agropyron caninum Beauv. II. Breamore.

Hordeum marinum Huds. III (1). It was some time before I could find any Lymington locality, but in 1900 this species proved to be abundant about halfway between Lymington and Keyhaven.

Scolopendrium vulgare Symons. II. Breamore.

Lastrea Thelypteris Presl. III (2). Two boggy alder swamps a mile or so S.S.W. of Lyndhurst Road Station (1889, &c.).

Pilularia globulifera L. III (2). Abundant in several of the shallow splashes near Lyndhurst Road Station.

BRYOLOGICAL NOTES.

By Ernest S. Salmon, F.L.S.

(Continued from p. 8.)

(30). Calyptopogon mnioides (Schwaegr.) Broth. (*concluded*).

I have in the above remarks spoken of the present species as belonging to the genus *Barbula*, reserving until now the discussion of the proper systematic position of Schwaegrichen's plant. As early as 1859, Mitten, in Journ. Linn. Soc. iv. p. 72, removed Schwaegrichen's species from *Barbula* to the genus *Streptopogon*, remarking:—"*S. mnioides* Mitt. (*Barbula* Schwaegr.). The calyptra of this species resembles that of *S. erythrodontus*, to which it is very closely allied." In Hooker's *Fl. Tasmaniæ*, ii. p. 376 (1860), Mitten observed:—"*S. mnioides* Mitt. Fertile plants of this curious moss, gathered in Chili by Lechler, have the calyptra large and mitriform; in other respects they agree well with Schwaegrichen's figure. . . . This species is very closely allied to *S. erythrodontus*." Finally, in 1879 (in Phil. Trans. Roy. Soc. Lond. vol. 168, p. 33), Mitten separated Schwaegrichen's plant from the other species of *Streptopogon*, observing as follows:—"*S. mnioides* Schw. t. 310 (*Barbula*) [differs from the other species of *Streptopogon* in having] the perichætial leaves much elongated, and different from those of the stem, simulating those of *Holomitrium*, and on this account should stand apart from the other species, thus:—

Streptopogon Wils. Theca in perichætio e foliis caulinis subsimilibus immersa, emergens, vel breviter exserta. Calyptra breviter multifida.

Calyptopogon Mitt. Theca in perichætio e foliis elongatis a caulinis difformibus exserta. Calyptra profunde plurifida.

The first group contains all the species of which the fruit is known, and which correspond to the typical *S. erythrodontus*, together with [*S. australis* and *S. gemmascens*]. The second group consists of *S. mnioides* alone."

It is not quite clear from the above remarks what was the precise position Mitten intended to give to *Calyptopogon*. The use of the word "group," and not "genus," and also the citation of Schwaegrichen's plant as *S. mnioides*, would indicate that *Calyptopogon* was instituted as a section of *Streptopogon*. This is the view taken by Paris, in whose *Index Bryologicus* (Suppl. i.) we find *Calyptopogon* referred as a section to *Streptopogon*, in which genus *S. mnioides* remains. On the other hand, Brotherus (in Engler and Prantl's *Pflanzenfamilien*, 214 Lief. p. 419 (1902)) quotes *Calyptopogon* as a genus. Mr. Mitten, in answer to an enquiry, has stated in a letter to me that, although at the time, in the work quoted above, he intended to make *Calyptopogon* only a section of *Streptopogon*, he is now of the opinion that it should rank as a genus.

I have examined all the species of *Streptopogon*, and it appears

quite clear to me that the present plant does not belong to this genus, from all species of which it differs widely in its dense papillose areolation and the differentiated perichætial leaves. In my opinion the present species shows in areolation more affinity with *Barbula* (*Syntrichia*) than with any other genus. We must note, too, that we find in certain species of *Barbula*—e. g. *B. pilifera* (Hook.) Brid., *B. calycina* Schwaegr., *B. brachychæte* Dusén, *B. brevisetacea* Hampe & C. Müll.—elongated perichætial leaves like those of the present species. The main point of difference in Schwaegrichen's plant is the shape of the calyptra. The calyptra, although described by Schwaegrichen as "subulata, latere fissa," and figured as split at one side only, as in the cucullate calyptra of *Barbula*, is really, as Mitten first pointed out, more or less deeply split at the base on all sides, and is consequently mitriform. There is a single calyptra in Schwaegrichen's type-specimen, and this is split in three places at the base (see figs. 19, 20). I have also seen calyptræ in Dusén's specimens of *S. crispatula* in the Kew Herbarium, and in every case they are split in several places at the base. In Lechler's plant in Schimper's herbarium, also, the young calyptræ show signs of splitting at the base along several lines. In the fruiting examples of *S. Hookeri* sent by Mr. Brown the shape of the calyptra, which was described as "mitriform, lobed at the base," is the same, as is shown at fig. 15. It may be observed here that among the calyptræ of *S. crispatula* examined one was found which was deeply split on one side only, two very short clefts being on the other side; so that the shape might be described as "subcucullate." I have seen the same variation as this in the normally mitriform calyptra of *S. erythrodontus* (see Ann. Bot. xvii. pl. viii. fig. 14). It has not apparently been hitherto noticed that the apex of the calyptra is distinctly rough with blunt tubercles (see fig. 15*a*); this can be most clearly seen in the young calyptra.

On the whole the present plant is perhaps best treated as generically distinct from *Barbula* on account of its strongly crisped leaves, which give a very distinct appearance to the plant, and its scabrous mitriform calyptra, and we may regard this genus *Calyptopogon*, with its single species *C. mnioides*, as a connecting link between *Streptopogon* and *Barbula* (*Syntrichia*).

As mentioned above, Brotherus has maintained *Calyptopogon* as a genus, and enumerates in it *C. mnioides*, *C. crispatulus*, *C. Hookeri*, *C. crispatus*, and *C. Wilhelmii*. Brotherus remarks, however, "Sämtliche Arten sind dem *C. mnioides* sehr nahe verwandt und werden wahrscheinlich bei reichlicherem Materiale z. T. eingehen." In the generic diagnosis of *Calyptopogon* given by Brotherus the tube of the peristome is described as not being produced beyond the mouth of the capsule. This is incorrect, however, as the lower part of the peristome is united into a tube (with a "tessellated" membrane), which extends from the mouth of the capsule to one-sixth or one-seventh of the length of the peristome (fig. 17).

As regards the "limb" of the leaf in *C. mnioides*, it may be noted here that this is unistratose throughout, even in the basal

part of the leaf where the limb becomes very wide and prominent. It is necessary to point this out, as the first glance at the systematic position assigned to "*Barbula crispata*" by Müller might lead us to expect the opposite. In the *Genera Muscorum*, p. 458, we find *B. crispata* Hampe placed with *B. Brebissonii* Brid. in the section "*Syntrichiæ limbatæ*" of *Barbula*—a section which is defined as follows:—"Blätter mit einem dicken Saum (*limbus*) umgeben, welcher aus mehreren Schichten dichter Zellen besteht und ganz rippenartig ist." Müller remarks that only two species are known in this section, and that each of these species constitutes again a type in itself. For *B. crispata* Müller proposes the name *Pachylomella*—"da besagter Limbus namentlich am Grunde des Blattes durch seine Breite und schöne goldgelbe Färbung ausserordentlich schön hervortritt, während er freilich nach der Blattspitze hin oft mehr ein einfaches *folium limbatum* bildet." From the characters given to the section in which the moss is placed, and the use of the word *Pachylomella*, one would infer that the limb of the leaf in *B. crispata* (=*C. mnioides*) was multistratose in some part of the leaf. This, however, is not the case, as figs 9, 10, which represent a transverse section of the limb in the lower part of the leaf, show. There are, indeed, no grounds for associating *B. Brebissonii* with the present species. The limb of *C. mnioides* is, without exception, always intramarginal above the sheathing part of the leaf, and this feature forms an important distinguishing character.

Among the specimens in Mitten's herbarium I have found a form of *C. mnioides* which differs from all other examples seen of the species, and which I propose to describe as a new variety under the name *anguste-limbatus*. The specimens in question occur with the type, and are labelled "Pine Hill, Dunedin [New Zealand], July, 1887, leg. W. Bell, nr. 439 in part." The plants of the variety form small olive-green tufts, 1·5 cent. high, and whilst agreeing completely with the type in general habit, and in the crisped and twisted leaves, show under the microscope constant differences in certain leaf characters. The leaf in shape does not differ from that of *C. mnioides*, but the areolation is more obscure, the papillæ of the cells are larger, and the limb is distinctly narrower throughout. The limb is intramarginal above the sheathing part of the leaf as in the type, and at halfway the length of the leaf is only 3 cells wide, whereas in the type it is here 4–5 cells wide. The areolation is very obscure, the separate cells being almost hidden by the papillæ. This very obscure areolation, together with the narrower limb, gives the leaves a distinctive appearance under the microscope. The limb as a rule is much paler than in the type, being sometimes almost white, although becoming yellow in the older leaves. The examples are barren, and the leaves bear gemmæ of the same nature as those of *C. mnioides* type.

I give below a full description of *C. mnioides* and its variety *anguste-limbatus*, together with the distribution and synonymy. I wish here to express my thanks to the authorities at the Berlin Museum and the Herbier Boissier for allowing me to examine certain types in Müller's and Schwaegrichen's herbaria, and to

Mr. W. Mitten, A.L.S., for kindly permitting me to see all the examples of *C. mnioides* in his herbarium.

CALYPTOPOGON MNIOIDES (Schwaegr.) Broth.

Barbula mnioides Schwaegr. Sp. Musc. Frond. Suppl. iv. pl. cccx. b (1842).

Tortula mnioides (Schwaegr.) Mont. in Gay, Fl. Chili, vii. 150 (1850); Wils. in Hook. f. Fl. N. Zeal. ii. 71 (1855); Wils. in Hook. f. Fl. Tasman. ii. 176 (1860); Hook. f. Handb. N. Zeal. Flora, 420 (1867).

Streptopogon mnioides (Schwaegr.) Mitt. in Journ. Linn. Soc. iv. 72 (1859); Mitt. in Hook. f. Fl. Tasman. ii. 376 (1860); Mitt. Musc. Austr.-Amer. 179 (1869); Jaeger, Adumbr. i. 255 (synon. quoad plantam Müllerianum et var. *prostratum* excl.) (1873); Mitt. in Phil. Trans. Roy. Soc. Lond. 168 (extra vol.), 33 (sect. *Calyptopogon*) (1879); Paris, Index Bryolog. (in Actes Soc. Linn. Bordeaux, li. 276 (synon. quoad pl. Müller. et var. *prostratum* excl.) (1897)).

Barbula crispata Hampe in *Linnæa*, xl. 304 (1876); C. Müll. Gen. Musc. Frond. 458 (sect. *Syntrichia limbata* vel *Pachylomella*) ("1901," *i.e.* 1900).

Streptopogon crispatus (Hampe) Jaeger, Adumbr. ii. 670 (1879); Paris, *l. c.*

Barbula (*Syntrichia*) *crispatula* C. Müll. in *Hedwigia*, xxxvi. 104 (sect. *Crispatæ*) (1897).

B. (*S.*) *Wilhelmii* C. Müll. *l. c.* (nomen) (1897).

Streptopogon crispatulus (C. Müll.) Paris, *l. c.*

S. Wilhelmii (C. Müll.) Paris, *l. c.* 277.

S. Hookeri R. Brown in Trans. New Zeal. Instit. xxx. 410, pl. xli. fig. 2 (1897); Paris, Index Bryolog. Suppl. i. 313 (1900).

Calyptopogon mnioides (Schwaegr.) Broth. in Engl. & Prantl's Pflanzenfam. 214 Lief. 419 (1902).

C. crispatulus (C. Müll.) Broth. *l. c.* (1902).

C. Hookeri (R. Br.) Broth. *l. c.* (1902).

C. crispatus (Hampe) Broth. *l. c.* (1902).

C. Wilhelmii (C. Müll.) Broth. *l. c.* (1902).

Dioicus, corticola [vel etiam, teste R. Brown, saxicola], dense vel laxiuscule pulvinatus, e olivaceo-viridi rufescens; caule erecto ad 2·5 cent. alto superne ramoso basin versus tomento fusco obtecto ad basin folioso, foliis caulinis junioribus luteo-viridibus senioribus rufescentibus erecto-patentibus vel patulo-patentibus (apicalibus interdum apice subrecurvis) siccitate crispatis et margine valde flexuosis sæpe apice spiraliter torquescentibus e basi contracta erecta semiamplexante in laminam concavam late et distinctissime flavo-limbatam aut oblongam apice acutam aut oblongo-lanceolatam apice subacuminatam nervo valido rufescente excurrente aristato-cuspidatam productis, margine ubique erecto folii basin versus subintegro superne tenerrime papilloso-crenato, cellulis basis vaginantis anguste elongato-rectangularibus luteis pellucidis parietibus porosis laminæ opacis obscuriusculis utrinque papillosis parvis 7–10 μ latis quadrato-rotundatis ætate subcollenchymatosis, limbo lato unistra-

toso flavo deinde subrufescente in folii parte basilari vaginante marginali exinde paullulum intramarginali e cellulis pellucidis elongato-rectangularibus 3–8–seriatis parietibus subporosis composito ad folii summum apicem producto vel paullulum infra evanescente, foliis superioribus et apicalibus in nervi facie ventrali superiore gemmas numerosas e viridi ferrugineas rotundato-oblongas vel quadratas vel irregulariter aggregatas multicellulares cellulis plus minus papillosis gerentibus, perichætio di–triphyllo, foliis perichætialibus caulinis diversiformibus longe exsertis ad capsulæ basin vel medium attingentibus vel raro eamdem paullulum superantibus subscariosis plus minus convolutis e basi contracta anguste elongato-ellipticis apice longissime sensim acuminatis 7–8 mill. longis, nervo percurso tenuiore, cellulis basis latioribus subrectangularibus cæteris omnibus angustis subprosenchymatosis parietibus incrassatis, limbo nullo, capsula in pedunculo ad 5 mill. longo erecto ætate siccitate dextrorsum torto breviter cylindracea 2·25–2·5 × 0·50–0·80 mill. erecta interdum leniter curvula et subinæquali badia basi ima stomatibus superficialibus paucis instructa, exothecii cellulis rectangularibus os versus subito minoribus hexagono-quadratis ore rubro crenulato, peristomio rubro 1·5–2 mill. longo fere ad $\frac{1}{6}$ tubuloso tubo rectangulari-tessellato dentibus sinistrorsum contorquatis nodulosis minute papillosis, annulo lato duplici arcte adhærente, operculo conico-subulato 2–2·35 mill. longo interdum curvulo cellulis spiraliter ordinatis flavicante basi margine rubro crenulato, calyptra fere ad capsulæ medium descendente subulata basi pluries fissa apice scabrida, sporis parvulis lævibus 13–20 μ.

Planta mascula sæpe femineis immixta et eisdem conformis sed caule minus ramoso, caule circ. 2 mill. alto sub perigonio innovante, foliis caulinis erecto-patentibus vel infra perigonium patulo-patentibus, perigonio crasso gemmiformi apicali vel ob innovationes infra perigonium oriundas ad latus dejecto, foliis perigonialibus exterioribus caulinis plus minus conformibus sed basi magis vaginante, interioribus arcte imbricatis e basi lata valde concava convoluta abrupte vel sensim acuminatis haud vel indistincte limbatis nervo excurrente cuspidatis, intimo minore concavo ovato acuto ad apicem nervato laxius reticulato, paraphysibus numerosis filiformibus articulis distinctis antheridia superantibus.

Hab. America Australis; Chili, c. fr. (Herb. Schwaegrichen)!; (Ex herb. Montagne in Herb. Schimper, c. fr.)!; Andes Chilenses, Cordillera de Raneo, ad arbores, etiam ad Arique, Valdivia, c. fr. (Lechler, nr. 654, July, 1851) (Herb. Schimper and Herb. Mitten)!

Ecuador:—Andes Quitenses, legt. Jameson (Herb. Mitten)!

Patagonia:—Inter 50°–53° lat. austr. cum *Ulota gymnomitria* C. Müll. (F. P. Moreno, 1884) (in Herb. Müller, sub *Syntrichia crispatula*)!; Patagonia occ., Rio Aysun, Dusén, 1898, c. fr. (in Herb. Müller, sub *S. crispatula*)!; Patagonia occ.; in valle fluminis Aysen in ramulis, c. fr. (P. Duséu, Feb. 1897, nr. 792 sub *S. crispatula*) (in Herb. Kew)!

Australasia; Australia:—In Monte Macedon ad ramos, pauca frustula, *Orthotricho luteo* intermixta (in Herb. Hampe sub *Barbula crispata*)!; Victoria, ad truncos arborum (legt. Wilhelmi, 1867) (in

Herb. Müller, sub *B. Wilhelmii*)!; Moe Swamp (Mueller), in Herb. Mitten!

Tasmania:—Mount Wellington (Mossmann, nr. 758 in part, in Herb. Mitten)!; in Monte Wellington (Weymouth, 1891), *fide* Müller in *Hedwigia*, xxxvi. 104 (1897), sub *B. Wilhelmii*; Northwest Bay River, on trunks of *Pomaderris apetala* Labill. (legt. Oldfield), in Herb. Kew!; on logs, Copse, Falls Run (W. Archer), in Herb. Kew!; on willows, Hobart Rivulet (leg. Weymouth, 1893, nr. 1691, in Herb. W. W. Watts, Musc. Tasman. nr. 372)!

New Zealand:—Northern Island, in cortice arborum (Colenso) in Herb. Kew!; Mungaroa (T. Kirk) in Herb. Mitten!; Stewart Island, Patterson Inlet, Jan. 1889, on dead branches (W. Bell), in Herb. Mitten!; Clinton Valley Sounds, S. Island, c.fr. (comm. Beckett, sub nr. 613 in Herb. W. W. Watts)!; Pine Hill, Dunedin, common on dead branches in moist shady places (W. Bell, July, 1889), in Herb. Mitt.!; on trees, head of Otira Gorge, alt. 3000 ft., c.fr. (R. Brown) sub *Streptopogon Hookeri*!; damp rocks and trees, common, Banks Peninsula, Moa Creek, Milford Sound, Clinton, Lake Te Anau, &c. (*fide* R. Brown in Trans. N. Zeal. Instit. xxx. 410 (1897), sub *S. Hookeri*).

Var. ANGUSTE-LIMBATUS var. nov. A typo differt: *foliis angustius limbatis*, limbo paullulum infra folii apicem evanescente, *cellulis obscurioribus*, papillis majoribus.

HAB. New Zealand:—Pine Hill, Dunedin, on dead branches, in moist shady places, *cum typo* (W. Bell, July, 1878, nr. 439 in part) in Herb. Mitten!

EXPLANATION OF PLATE 445.

Calyptopogon mnioides (Schwaegr.) Broth. (Unless otherwise stated, all figures are drawn from the type in Schwaegrichen's herbarium.) Fig. 1. Leaf from the upper part of a stem, bearing gemmæ, × 16. 2. Areolation at margin of same, at about one-sixth from the apex, showing the intramarginal "limb," × 300. 3. Areolation of a stem-leaf of "*B. crispata* Hampe," at one-sixth from the apex, showing the papillose-crenulate margin and intramarginal "limb" (from an authentic specimen in Müller's herb.), × 300. 4. Areolation of upper part of a stem-leaf of "*S. crispatula* C. Müll.," from the type in Müller's herbarium, × 300. 5. Transverse section of the nerve of a stem-leaf, towards the base of the leaf, showing a group of six "companion-cells," the four "pointer-cells," and the dorsal stereid-band, × 300. 6, 7. Two transverse sections of the upper part of a stem-leaf, showing the gemmiferous cells on the ventral surface of the nerve, × 300. 8. Transverse section of the margin of a stem-leaf, at one-third from the apex, showing the unistratose "limb," × 300. 9, 10. Ditto of "*B. crispata* Hampe" and "*S. crispatula* C. Müll.," in the lower part of the leaf, showing the unistratose "limb" (from the type-specimens in Hampe's and Müller's herbaria), × 300. 11, 12. Two gemmæ from a stem-leaf, × 170. 13. A perichætial leaf, × 8. 14. Areolation of same, at half the length, × 300. 15. Capsule with calyptra, × 14; at *a* the blunt tubercles towards the apex of the calyptra, × 300 (from an authentic specimen of "*S. Hookeri* R. Br."). 16. Nearly mature capsule with operculum, × 14 (from an example of "*S. crispatula*" Dusén, nr. 792, in Herb. Kew). 17. Mature capsule with peristome, showing the exserted tubular base, × 20 (from the example of "*S. crispatula*" (coll. Dusén) in Müller's herbarium). 18. Spores of same, × 270. 19, 20. The single calyptra of Schwaegrichen's type-specimens seen from one side, and, fig. 20, seen from the other, × 18.

WAYFARING NOTES FROM THE TRANSVAAL.—I.

By R. F. Rand, M.D., F.L.S.

Johannesburg District.—The physical features of the country in the immediate neighbourhood of the town are sufficiently varied. The hills consist mostly of bare rock, but the dales are fertile near the small streams, which are only too rare. There is a great scarcity of native trees; for this the woodcutter, veld-fires, and the close cropping of bygone generations of antelope may be in varying degree responsible. Eucalypti, acacias, cypresses, &c., have been freely planted and have thriven. They relieve what would otherwise be bare veld, and give welcome shade; they are, however, like our own countrymen, mere immigrants.

As to native trees. Several species of *Protea* flourish upon the terraced ledges of quartzite which form the extreme northern escarpments of the Witwatersrand range. Upon the scanty talus at their feet one finds native acacias, *Dombeya*, *Kigellaria*, among trees, and various shrubs. The escarpments face north, and so face the sun in this hemisphere. They have a broken surface, and, among the rocks, shrubs and small trees cling wherever the soil yields foothold. Cotyledon, aloes, and *Vellozia* abound. The species of *Aloe* most frequently seen is small, but upon the Klipriversberg, near by, one about ten feet in height was noted. One sometimes sees a shrub, *Rhus*, clasping the surfaces of a boulder, and moulding its shape closely upon it. In exposed places some few shrubs live, but they are mostly gnarled, woody, and wind-wrung.

Upon the open rolling veld, of native trees there are practically none. Here and there confused, untidy-looking heaps of stone mark some bared dyke of greenstone, and around and among these, shrubs and small trees may often be found. Native trees are plentiful in Rhodesia, so that the lack of them here is noteworthy. The early spring flowers of the veld have charm, as the examples sent will show; but they are not so abundant, nor is their colour so brilliant, as those of the more tropical veld.

I write early in October, having commenced collecting within easy walking distance of Johannesburg at the beginning of September. The winter has been a long and a dry one, as I have been told. The first ample rain fell in mid-September. As in other parts of this continent, many flowers appear before the rains fall; among many instances one may note *Gnidia*, *Pentanisia*, *Oldenlandia*, *Hypoxis*, *Morea*, *Gazenia*, *Aster*, *Othonna*, sundry Senecios, and *Tulbaghia*.

The high winds, which are so prevalent, must influence plant-life to a considerable degree. Many of the Composites appear to be well fitted to meet this condition. They are firmly rooted, and their rosette of radical leaves presents no wind-surface. They only shoot up their flower-stalks after the development of the flower in the bud is well advanced. During the period of flowering, notably in those with single-headed capitulum, the flower-stalk is lissom,

and gives to the wind. After fertilization the stalk increases in rigidity until the fruit is ripe, and now, by standing up to the wind, secures a better dispersal of the ripened seed. The like is apparently common in many other families.

In such a huge order as that of the Composites, the stranger among them gladly fastens upon any feature that may aid him in classifying, and it would seem that note of physiological function may often be advantageously taken in conjunction with consideration of structure.

In the few South African Composites seen by the writer, excluding the more obvious characters, points which may aid would appear to be—

a. The hairs or emergences of the achene: their character, shape, disposition; whether evenly dispersed over the surface of the achene, arranged in longitudinal rows, as is so common, or aggregated at the base. The coronal distributive hairs (pappus proper) clearly function as the medium by which the wind spreads the fruit abroad, but the structure (often glandular or hooked) of the hairs upon the body of the achene would appear to point to their being fixative, *after* distribution is accomplished.

b. The disposition of the barbs upon the pappus-hairs, *i.e.* upon the main body of the shank, whether closely set or placed at extended interval. This apart from the closer ranging which is usual towards the extremity of the hair.

c. The shape of the corolla of the disc-floret merits close description, and the point at which the filaments stand free from the corollal tube.

d. The bulging of the filament, so frequently seen below the anther, is often characteristic. It may be clear when the rest of the filament is tinted, and the arrangement of the surface-cells in that region is closer than upon the surface of the filament generally.

e. Variations in the shape of the projecting tips of the anthers may well be noted; usually hastate, they may be cordate, or have their tips rounded off.

f. As to the significance of the "anther-tails." Where they have no whisk and are merely dwindling prolongations of the lower ends of the loculi, it is hard to see that they have much functional value. The tails are almost of necessity absent where the disc-floret has an urceolated tube.

g. The pollen grains. Their colour, shape, size, quantity, and surface-markings.

h. Dark colouration of the external face of the ray-floret, for this appears to be correlated with exceptional sensitiveness to atmospheric changes.

i. The depth of the involucral cup given in millimetres.

j. The involucre, of course, in many cases, actively participates in the closing of the flower, and its description might be made with this kept in view.

How great a variation in colour may take place, within the limits of species, may be seen in *Gerbera discolor* Sond. and *G. plantaginea* Harv. (a small form). Both disc and ray may be of a pale

primrose tint, or they may be orange, or even purple. When the disc-flowers are purple the pappus is coloured in like wise, and examination of the pappus shows the colouring matter to be most abundant in the barbs of the hair. This species closes, however bright the day, at about 2 p.m.

Gazania Krebsiana Less. is interesting; it has a scanty latex and other xerophytic armament. The flowers expand broadly in bright sunshine, and are very sensitive to weather-changes, mostly closing if the sky be overcast. Here one may note that a large proportion of the plants met with up to the present show xerophytic characters; indeed, a leaf with a "drip-tip" is rare.

As to *Othonna scapigera* Harv. the involucre increases in fleshiness as the seed ripens, The valvular edges of each involucral leaf close in, each upon one of the fertile peripheral achenes, partially ensheathing it.

Up to this date five different species of Asclepiads have been noted. Bees would appear to be the most efficient agents in the fertilization of many. They sprawl over the flowers, their feet slipping into the chinks between the anthers, and one may often see them tugging to free themselves. I remember seeing, upon the slopes of Table Mountain, an Asclepiad of erect habit and large-flowered, perhaps a *Gomphocarpus*, upon whose flowers were several detached legs of flies, held fast. Upon pulling these out, pollinia were found to be attached to them. It would seem, therefore, that either insects of a certain strength are required, or that the hold of the pollinia upon the authers is a tight one until mature. At least it is clear there is a nice balancing, and that the flower deals roughly with unwelcome visitors.

In my note written several years ago from Rhodesia (Journ. Bot. 1898, 141, 345), mention was made of the method by which the distribution of the seeds of *Brunsvigia* is effected. Two other species were observed in the eastern district of the Cape Colony, of purple colour, and with fewer flowers than the Rhodesian species. The dried head forms a globular mass of projecting spokes, as usual, but, very curiously, the mass breaks off at the *foot* of the scape, and not at its summit. The scape either rots, or becomes brittle, close to the ground, and is therefore carried off along with the head when the wind dislodges it. Sometimes the dislodgement is brought about by the vegetative leaves which come up later and push the scape aside. Once detached, the head is free to travel, which it does very heartily, leaping before the wind should it chance to have clear open country before it.

It may be interesting to note that two species of *Zygophyllum* were noticed growing side by side upon the sand-dunes close to Port Elizabeth, Cape Colony. One was a shrub, the other a small prostrate herb. Both were in fruit. The capsules of the shrubby one were generously winged, those of the herbaceous one were smooth.

NOTES ON BRISTOL PLANTS.

By Cedric Bucknall, D. Fry, & J. W. White, F.L.S.

These records are in continuation of those published in this Journal for 1893, 1897, 1899, and 1901. Watson's vice-counties 34 (W. Gloucester) and 6 (N. Somerset) are distinguished by G. and S. respectively, and new vice-comital records are preceded by an asterisk.

**Lathyrus tuberosus* L. Several plants growing in a hedge amongst thorns near Keynsham, S., where, though it can hardly, perhaps, be regarded as other than a casual or alien, its occurrence is remarkable and somewhat difficult to understand, because the habitat—an old pasture surrounded on all sides by similar enclosures—is one where it is not likely to have been introduced with foreign seed or intentionally planted.

**Rubus argentatus* P. J. Muell. var. *robustus* (P. J. Muell.) (*fide* Rev. W. Moyle Rogers). Rather abundantly near Damory Bridge, G. Some of the plants Mr. Rogers, we believe, considers typical, while others, he thinks, show an approach to var. *clivicola* A. Ley.

**R. Borreri* Bell.-Salt. var. *dentatifolius* Briggs (confirmed by Rev. W. Moyle Rogers). Several bushes on sand-hills by the shore of the Bristol Channel, at Berrow, S.

Rosa collina Jacq. Abundant in some ancient hedges on Potters Hill (660 ft.), near Felton, S.

**Pyrus Aria* Ehrh. var. *rupicola* Syme. One tree in a side valley of Burrington Combe (Mendip); Callow Rocks (Mendip); Sandford Hill, S. The Rev. A. Ley agrees to the name.

**P. intermedia* Ehrh. Cheddar Gorge, S. This discovery is due to the Rev. A. Ley, who, in the autumn of 1901, detected two or three small trees near the road. This summer two large trees were found on the high cliff.

Myriophyllum alterniflorum DC. In several ditches on the Nailsea side of Tickenham Moor, S.

Apium inundatum Reichb. fil. Plentiful in several ditches in the central part of Edington Peat-moor, S.

Crepis taraxacifolia Thuill. Abundant in a pasture between Henbury and Westbury-on-Trym, G., and sparingly in an orchard at the latter place. This continental species appears to be rapidly spreading in Britain. In our own district, which comprises an area corresponding to that of the Bristol Coal Field, we find it in many localities—often abundantly—from which a few years ago it appeared to be entirely absent.

Symphytum asperrimum Bieb. This introduced species was found this summer growing in great abundance for fifty yards on both sides of a road through pastures between Wrington and Burrington, S., where it had evidently been long established. It has also been known for many years in ground adjoining Brass Knocker Wood, near Bath, S.

**Utricularia neglecta* Lehm. In turf pits recently excavated on Shapwick Moor, S. New to Somerset. According to the Rev.

R. P. Murray (*Fl. Somerset*, p. 259) *U. vulgaris* is "frequent on the peat-moor from Burtle to Glastonbury," but it was not found by us in association with *U. neglecta*; and the Rev. E. F. Linton in his paper on *Utricularia* (Proc. Dorset Field Club 1894) states that the two species seldom occur together.

Polygonum minus Huds. A few fine plants in one spot on Edington Moor, S. Recorded by Sole in 1782 as abundant on the peat-moor (*Fl. Som.* p. 286), but not seen there by any botanist since that date until we found it at the above locality in September last. Only known at one other station in Somerset.

Potamogeton heterophyllus Schreb. This had been recorded for North Somerset by three botanists of the last generation, viz., Flower, St. Brody, and Swete; but in default of recent confirmation the plant was excluded from the *Fl. Somerset* and from that of the Bristol Coalfield. We have this autumn gathered specimens on Clapton Moor, and have seen others from the old coal canal near Paulton, and from Portishead Marshes.

Equisetum hyemale L. and *E. variegatum* Schleich. These grow together in a rough sandy field at Weston-super-Mare, S., and for information respecting them we are indebted to Mr. H. Corder, of Bridgwater. Nothing was previously known of these plants in Somerset, excepting that in Babington's *Flora Bathoniensis* there is a record—never confirmed—of *E. hyemale* as having been found "on the canal bank" by Dr. Davis, and that in *Topographical Botany E. variegatum* is doubtfully cited for Somerset North.

Chara fragilis Desv. Turf pits near Ashcot railway station, and in ditches on Clapton Moor, S.

Correction.—The record of *Utricularia intermedia* Hayne for Weston-in-Gordano, N. Somerset, published in the Journal for 1901 (p. 92), is an error. A further examination of the plant in question has convinced the Rev. E. F. Linton that it is certainly not *intermedia*, but he cannot at present give it a name. Our inability to obtain flowering stems has materially increased the difficulty of determination.

SHORT NOTES.

Damasonium Alisma Mill. Dict. ed. 8 (1768) (*D. stellatum* Thuill. Fl. Par. ed. 2, 186 (1799)).—This species, decreasing in England, used to grow in several places on Mitcham Common, Surrey. In the year 1881, in May, it occurred in a rather deep pool about the middle of the common, but in a form that I cannot find mentioned in any British Flora, *i. e.* with leaves (petioles?) as in *Sagittaria*, twelve inches long × one-eighth inch wide, and pellucid; a few of the inner leaves had just begun to develop oblong-linear laminæ. Cosson and Germain (Fl. Paris, 521 (1845)) remark: "Feuilles pétiolées, un peu cordées ou tronquées à la base, quelquefois linéaires par l'avortement du limbe lorsqu'elles se développent sous l'eau."

The plant used to grow on Wandsworth Common, but I have not seen it there for the last twenty-five years. In the lately published *Flora of the East Riding*, p. 193, Mr. Robinson, the author, remarks: "Seen frequently in the seventies by the late Mr. E. A. Peak and Mr. T. Dennis, near Stoneferry, Hull. Not seen of late in this station, but the pond and dike still exist, and probably also the plant." I wrote to Mr. Robinson respecting this, and pointed out how unlikely the habitat was; but in his reply he said the first-named gentleman had a good knowledge of British plants, and that a botanist from Scotland (a friend of his) had first found it. Mr. Robinson himself had not seen specimens. He adds that "it seems very unlikely to have been introduced." Although many aquatic species are grown in ponds, &c., I have never seen this plant, but I am still sceptical as to its occurrence as native.—Arthur Bennett.

It would seem that *Damasonium* must be reckoned among the plants of uncertain occurrence. I pointed out (Journ. Bot. 1892, 247) its remarkable increase on Naphill Common, near High Wycombe; it continued to extend for some years following, but last year it had almost, if not entirely, disappeared: I make this qualification because, although I did not see it, I did not make so thorough an investigation of the ponds as would justify me in saying the plant was altogether absent. As to its introduction, a reference to the note cited will show that in Epping Forest it was planted by a member of the Toynbee Natural History Society, whose pernicious practice renders doubtful recent records from that and other London localities.—James Britten.

Euphrasia Scotica.—In this Journal for 1891 (p. 161) I noticed and described, under the name *E. paludosa*, a new and very distinct form of *Euphrasia*, which I found growing abundantly in wet boggy ground in the neighbourhood of Braemar. I was not aware at that time that Robert Brown had given this name to an Australian species, and Prof. Wettstein, in his monograph of the genus (p. 170), has named my plant *E. Scottica*, more correctly spelt *Scotica*, under which name I have described it in my monograph of the British species published in this Journal for 1897 (p. 425).

The area of this species has been greatly extended since my first notice. It has been found in Devonshire and Yorkshire, in Flintshire, in Aberdeenshire, Argyleshire, Banffshire, Elgin, Inverness-shire, Orkney, Shetland, Perthshire, Ross-shire, Faroe Islands, Sutherlandshire. In Ireland it has been found in Carlow, Kildare, Louth, Tipperary, Galway, Mayo, and Roscommon. Hybrids between this and some glandular species have occurred in Nairn, Aberdeen, and Ross. In the latter case I believe the parents to be *E. brevipila* × *Scotica*. Thus the species is found—in two counties in England, in one county in Wales, in ten counties in Scotland, and in seven in Ireland; and hybrids in three Scottish counties. Its habitat is in wet bogs, so that Scotland and Ireland present more favourable ground for its development; but it is evidently a northern form, and it will be interesting to know if it occurs on the mainlands of Norway and Sweden, &c. In its normal form it is a very marked species, and could hardly be mistaken; but there are

abnormal forms and possibly hybrids which, though not frequent, may be difficult to determine. It is so with other species of this genus. Very diminutive starved specimens are occasionally to be met with, which may be difficult to distinguish from similarly starved specimens of *E. gracilis* Fr., but well-grown examples of these species could not be confounded. A very interesting form has been found in the Island of Bordö, in Faroe, by Messrs. Hartz and C. Ostenfeld. The specimens are 26 centim. (10¼ in.) in height. The leaves on the middle of the stem are 16 centim. ($\frac{5}{8}$ in.) in length by 10 mm. ($\frac{3}{8}$ in.) in width. The capsules are 8 to 9 mm. ($\frac{5}{16}$ in.) in length by 4 centim. (nearly $\frac{3}{16}$ in.) in width. The internodes are long. The spike is interrupted below, as is eminently characteristic of the species. The flowers are small, and do not partake of these exuberant proportions.—Fredk. Townsend.

Lythrum Graefferi Ten. in S. Devon.—A single specimen of this species was gathered by Miss E. Butler in a little-frequented lane near Bovey Heath, Bovey Tracey, in August last. There were no houses near, but the place is rather close to a line of railway.—R. F. Towndrow.

Mougeotia immersa (Journ. Bot. 1902, 144).—I described this plant from India as a new species of *Mougeotia*; having received a further supply of specimens, I find it will be better placed under the newer genus *Debarya* as *Debarya immersa*.—Wm. West.

Alopecurus hybridus in Leicestershire.—Last summer, while examining the rough herbage bordering the Trent, at a point where the river separates Nottinghamshire from Leicestershire, near Kegworth, I alighted on a patch of *A. hybridus* Wimmer (*A. pratensis* × *geniculatus*). This straggling ascending habit was exactly that of the Warwickshire plant described by me in this Journal for 1901, p. 232, and further examination showed it to possess characters exactly intermediate between *A. pratensis* and *A. geniculatus*. Mr. J. E. Bagnall, in his *Flora of Staffordshire*, makes no mention of the occurrence of *A. hybridus* in that county, where it has been found in wet meadows by the Trent, near Armitage, by the Rev. H. P. Reader. Mr. Bagnall calls the Armitage plant var. *pronus* Mitten; but Mr. Arthur Bennett has pointed out (Journ. Bot. 1899, p. 368) that this name must be struck off our lists, Mr. Mitten having since informed him that the plant on which the name was based was an abnormal form occasioned by an insect which had infested the flowers. I should add, that in its Leicestershire locality *A. hybridus* is accompanied by the assumed parent species, and that Prof. Hackel is responsible for the name.—A. Bruce Jackson.

Eryngium maritimum L.—In the notes and letters of Sir T. Browne (quoted in my note on *Acorus* on p. 23) is the following note respecting this plant:—"Ringlestones, a small white & black bird like a wagtayle, & seemes to bee some kind of motacilla marina, common about Yarmouth sands. They lay their eggs in the sand & shingle about June, and as the eryngo diggers tell mee, [do] nott sett them flat, but upright like egges in salt." (p. 23). The eryngo is

no longer an article of commerce at Yarmouth, and its diggers are extinct; but I believe the roots are still used in a candied form in some parts.—Arthur Bennett.

Glyceria distans var. obtusa.—This variety is not included in the last edition of the London Catalogue, nor is it mentioned in the *Flora of Leicestershire*, published in 1886, though several localities are given for the type. Until recently no specimen of *Glyceria distans* was to be found in the county herbarium deposited at the Leicester Museum, the plant apparently not having been detected in Leicestershire by any living botanist. When examining the Glycerias in the Babington herbarium at Cambridge last year, I came across a sheet labelled *G. distans* var. *obtusa* Parnell, gathered by the side of the tramway near Breedon Cloud Wood, Leicestershire. Prof. Babington in his Journal, p. 63, mentions finding this grass in this locality on June 23rd, 1837, and adds that he considered it allied to *G. distans*, or perhaps only a variety of that plant. In August, 1901, in company with my friend Mr. T. E. Routh, I visited the locality, and after a short search found a *Glyceria* which was evidently Babington's plant. It grew on the magnesian limestone between the rails of the lines used for conveying stone from the quarries and on adjoining ground. Most of the specimens were quite past flowering, and dried up by the recent drought, but a few were found with spikelets intact. Parnell's variety—I have not seen his original specimens—is said to differ from the type in having the ligule transversely truncate instead of deltoid, and the lower pale transversely truncate, not obliquely. I found, on comparing these Leicestershire specimens with examples of the type from maritime and inland localities, that there was no appreciable difference in the shape of the glumes, the other characters given for the variety being also unstable. There is a slight difference in habit, however, the Breedon plants being of slenderer build, and having the panicle more contracted. These differences are perhaps due to environment. Prof. Hackel, to whom I sent a specimen, says "it does not sensibly differ, whether in the form of the apex of the pales or in the shape of the ligule, from specimens from type localities." He adds that it varies somewhat in regard to the apex of the pales being more or less truncate, and does not consider it a variety worth naming. He points out, however, that our plant differs somewhat from maritime specimens. Syme, in *English Botany*, mentions Bideford, Devon; Beadley Bay, Gloucester, and Dublin and Breedon, as localities for the variety. In the Leicestershire flora, *Glyceria distans* is recorded by the older botanists from several stations, including Breedon, but the variety is not distinguished.—A. Bruce Jackson.

Senecio Cineraria DC.—This plant, which is a common one in gardens at Torquay, is now naturalized on the cliffs some distance beyond that town. There has been a small clump of the same plant for several years past growing on a steep rocky bank by the high road at Sidcot, near Winscombe, Somerset.—W. F. Miller.

NOTICES OF BOOKS.

Index Kewensis Plantarum Phaneroyamarum, Supplementum Primum. Confecerunt THEOPHILUS DURAND & B. DAYDON JACKSON. Fasciculus ii. [Cymbidium–Iriha] 4to, pp. 121–224. Bruxelles: A. Castaigne.

WE welcome a second instalment of this much-needed supplement to Mr. Jackson's admirable *Index Kewensis*. Considering the labour which the revision of the text must involve, especially to M. Durand, whose sight, we regret to learn, is failing, the issue of this part within ten months of its predecessor shows no undue delay, although those who constantly need to have recourse to its aid would welcome a more speedy production. Our notice of the first fasciculus (*Journ. Bot.* 1902, 162) pointed out certain features wherein the supplement differs from the *Index*, and there is no need to repeat what was then said. We regret, however, that the editors have ignored the caution we then gave as to the citation of names from the inaccurately dated *Kew Bulletin*. The genus *Hirschia*, *Dombeya arabica*, and *Grantia senecionoides* have no claim to appear in a list which does not go beyond 1895, for notwithstanding the misleading date of the *Bulletin*, both on title-page and on the number quoted, they were not published until 1896. It may be doubted whether any publication of recent times is likely to give so much trouble in the matter of dates; and it is only by constantly calling attention to its misleading character that the mischief can be minimized. It is also, we think, to be regretted that *nomina nuda* of the most pronounced type should be quoted from the seed-list which appears in the *Bulletin*—e. g. "*Hutchinsia gracilis* Hort."; it is not easy to understand why the Kew authorities should have allowed such a name to pass into print, but it certainly has no more claim to recognition than the wonderful series which embellished the Kew seed-list of 1885.

A certain number of misprints must of course occur in a work of this kind. One or two are curious: e. g. "*Hieracium rubicundum* F. J. H. Moffat ex F. Hanbury," where the locality is taken as the name of the describer. (We are not sure that "F. Hanbury" is a justifiable abbreviation of Mr. Hanbury's name; "F. J. Hanb." would have taken no more room, and seems more correct.) The Messrs. Linton will not be pleased to find *H. holophyllum* attributed to "Linton" simply, which they interpret (see *Journ. Bot.* 1902, 362) as E. F. Linton; in the instance cited, W. R. Linton is intended. By the way, we do not see why, when a species has been first described in a journal easily accessible, a second reference, and that to the report of a Botanical Exchange Club, should be added; the work claims to be an index, not a bibliography. The ten years' additions to the nomenclature of *Hieracium* occupy twenty-three columns! *Erica flava*, with a reference to this Journal, is an error —*Blæria flava* is intended; *E. Junonis* should be *E. Junonia*. It is not wonderful that names differing only in one letter should occasionally be confused, as in *Ipomœa Morongii*, attributed to

"Britten" instead of to "Britton"; but it is less easy to see why J. N. Rose appears as "N. E. Rose" in all the entries under *Houstonia* and elsewhere. *Eriosema pulcherrimum* Taub. (1894) is evidently identical with *E. pulcherrimum* Baker f. (1895), the striking appearance of the plant having suggested the same name to both authors. Two omissions may be mentioned here—*Cordia Bakeri* and *Ehretia Bakeri*, proposed in this Journal for 1895 (p. 88, footnote) for *C. obovata* Baker in Kew Bull. 1894, 28, non Balf. f. in Proc. R. Soc. Edinb. xii. 80 (1883), and *E. macrophylla* Baker, *l. c.* 29, non Wall. in Roxb. Fl. Ind. (ed. Carey) ii. 343 (1824). It is needless to say that trifling errors such as these do not depreciate the value of the work; the wonder is that there are so few of them!

A Sketch of the Life and Labours of Sir William Jackson Hooker. (With Portrait.) By Sir Joseph Dalton Hooker, G.C.S.I., &c. *Annals of Botany*, December, 1902, pp. cxxxi. Price 14s.

It is greatly to be regretted that this important and interesting memoir should have been issued as a number of a periodical instead of as a separate volume. We can see no gain in this method of publication, which is less accessible and in every way less convenient than a separate volume would have been. Apart from this, we have nothing but praise for the latest—we hope not last—of the works by which Sir Joseph Hooker has made the scientific world his debtor. Many of these were undertaken when he was Director of Kew Gardens, a position wherein, if we may accept the view of his successor, the weight of the Empire is more felt even than by the Prime Minister;* and from these pages it is easy to see whence Sir Joseph derived the enthusiasm for work which made his directorate even more illustrious than that of his father. In each case, too, external work in no way interfered with that connected with the Kew establishment; thus we read that between 1844 and 1862 Sir William brought out no fewer than twenty-one editions of the popular Guide to the Gardens, the last issue of which appeared in 1885.

The "Sketch," as Sir Joseph modestly terms his work, is much more than a biography of Sir William; it contains, from original documents, an account of the circumstances that led to the transference of the Gardens, then the private property of the Sovereign, to the nation as a scientific establishment; and the narrative is annotated throughout with biographical information as to various of the persons incidentally mentioned. The appendices contain a complete bibliography of Sir William's works, with notes and observations; a list of his chief correspondents, with dates; and "an attempt to classify the more important articles contained in the Botanical Journals edited by Sir W. J. Hooker." This last,

* "Dyer writes: 'I often think, and have no doubt often said, that we at Kew feel individualiy the weight of the Empire as a whole, more even than they do in Downing Street.'"—Sir M. Grant Duff's *Notes from a Diary*, 1881–86, ii. 21 (under date March 1, 1885).

divided as it is under seven heads, does not seem to us sufficiently useful to compensate for the labour involved in its compilation; a complete index to the Hooker Journals has, of course, long been a desideratum, but such an index should be under one alphabet, and the sevenfold division of the present instalment detracts from whatever practical utility might otherwise attach to it.

We note that Sir Joseph, when speaking of the acquisition by the Government of Sir William's Herbarium, does not mention the terms upon which this transference took place. A memorandum of Sir Richard Owen, now before us, enables us to supply this information. It runs:—

"In a statement or report to the Office of Works, Sir W. Hooker proposes that, after his demise, '4 [? 6] competent botanists or other naturalists of eminence be appointed, 3 on the part of H.M. Government, and 3 on the part of my son, to arrange the terms of purchase.' Dr. Hooker reports (March 4, 1866) that 'the values assigned to the Herbarium varied between £5000 and £10,000.' In a Treasury Minute of Oct. 13, 1866, 'their Lordships have directed that provision may be made in the Estimates for 1867–8 to be submitted to Parliament in the ensuing session'; and a Supplementary Vote was passed 14th March, 1867, for £7000; *viz.* for the Herbarium £5000, for the library £1000, for portraits, &c., £1000." The names of the valuers were not known to Owen.

Syllabus der Pflanzenfamilien. Von Dr. Adolf Engler. Third, revised edition, 8vo, pp. xxvii. 233. Borntraeger: Berlin. 1903. Price 4 marks.

The chief differences between the third edition of Prof. Engler's syllabus of plant families and the second, published in 1898, are the reinclusion of an introductory chapter on the principles of the systematic arrangement, which was omitted from the second edition; a sketch of the division of the earth into floral regions and their subdivision; and an alteration in the grouping of the Thallophyta. In the edition of 1898 four great sections of the plant-world were recognized: Myxothallophyta, Euthallophyta, Embryophyta Zoidiogama (Archegoniatæ), and E. Siphonogama (Phanerogamæ). The Euthallophyta included the four subsections: Schizophyta, Flagellatæ, Euphyceæ (Algæ), and Eumycetes (Fungi). In the present edition there are thirteen sections. The increase in number is due to the raising to sectional rank the Schizophyta, Flagellatæ, and Eumycetes, as well as the classes of Euphyceæ. Thus the Algæ, as a group, disappear, and we have a number of distinct sections: Dinoflagellatæ (Peridineæ), Zygophyceæ, Chlorophyceæ, Charales, Phæophyceæ, Dictyotales, and Rhodophyceæ.

Apart from the alteration of relative rank, the sections remain the same as the subsections and classes in the edition of 1898; no attempt has been made at revision. The Chlorophyceæ, for instance, are still arranged in the same three classes—Protococcales, Confervales, and Siphoneæ, and there is no reference to the

newer system which has been elaborated, mainly by the efforts of Scandinavian botanists.

In the Eumycetes there are a few alterations; Basidiomycetes are placed at the end, *i. e.* after instead of before Ascomycetes, and the Fungi Imperfecti are more fully elaborated.

In the higher plants the arrangement is unaltered; the group Cycadofilices appears as an appendix at the end of the Pteridophyta, while in the flowering plants there are a few alterations in the details of arrangement of the natural orders and their subdivisions.

A. B. R.

BOOK-NOTES, NEWS, &c.

The third volume of Dr. Carlos Reiche's *Flora de Chile*, which was begun in 1895, appeared towards the end of 1902. Unfortunately no exact date is given, and the work is rendered difficult for ready consultation by the fact that only the author's name and an extended title ("Estudios criticos sobre la Flora de Chile") appear as headings throughout: neither order nor genus under treatment is indicated; to make matters worse, only the initial of the genus is given in the text, which, moreover, is often divided in the middle of a description. It is much to be regretted that matters of this kind, small in themselves but of great practical importance, are so often neglected by those who produce books of reference. The present volume contains the *Loasaceæ*, *Umbelliferæ*, *Rubiaceæ*, *Compositæ*, and some smaller orders.

The Naturalist for January contains an interesting and suggestive paper by Dr. William G. Smith, of the Yorkshire College, Leeds, on "Botanical Survey for Local Naturalists' Societies." Mr. W. D. Roebuck, who has been editor of *The Naturalist* since 1889, has resigned that post, and is succeeded by Messrs. T. Sheppard and T. W. Woodhead.

Vol. x. of the *Memoirs of the Torrey Botanical Club* is devoted to a paper, full of interest and learning, by Mr. Edward Sandford Burgess, detailing the "History of Pre-Clusian Botany in its Relation to *Aster*." We hope to notice it later.

The last part of the important *Synopsis der mitteleuropäischen Flora* by Drs. Ascherson and Graebner contains the index to the Gymnosperms, Pandanales, and Helobiæ, and the first portion of that to the Grasses.

The first part of Prof. Sargent's *Trees and Shrubs*, to which we referred in our last volume (p. 398), has appeared. It contains twenty-five plants, mostly new, including seven new species of *Cratægus* by the editor and four of *Lonicera* by Dr. Alfred Rehder, as well as a new genus, *Faxonanthus* (after the late Edwin Faxon), established by Mr. J. M. Greenman on no. 8594 of Pringle's Mexican collections; this seems to belong to *Ericaceæ*, but the order is not mentioned. The plants appear in no ordinal sequence, and

it is, we think, to be regretted that the plates and text are numbered continuously; each, however, is so printed that any arrangement may be adopted in binding up. Mr. C. E. Faxon's plates are doubtless accurate, but their arrangement might easily be improved; there seems no reason for such throwing together of fragments as appears in *Malus Halliana* and others.

Mr. J. C. Willis has followed his revision of the Indian *Podostemaceæ*, to which we referred last year (p. 304), by some elaborate studies in the morphology and ecology of the order, which forms part 4 of the first volume of the Annals of the Peradeniya Gardens. The paper, which is evidently a valuable contribution to the knowledge of these curious plants, is illustrated by thirty-three excellent plates.

The concluding fascicle (cxxvi.) of the second volume of M. Cogniaux' monograph of the *Orchidaceæ* of the *Flora Brasiliensis* was published in December.

The appearance of a new part of the Chinese Flora (Journ. Linn. Soc. xxxvi. pp. 1–72, Jan. 1) so soon after the last long-delayed instalment, is a happy augury for the speedy progress of that useful work. It is mainly devoted to the *Orchideæ* (by Mr. Rolfe), the other orders treated being *Hydrocharidaceæ*, *Burmanniaceæ*, and (in part) *Scitamineæ*, by Mr. C. H. Wright. Mr. Rolfe has overlooked Dr. Rendle's paper in this Journal for 1902 (p. 310) and has thus omitted from his enumeration the genera *Calanthe* and *Hetæria*, there added to the Chinese Flora.

We are glad that the Linnean Society has decided to take steps to secure such an alteration of its Charter as will allow of the admission of women as Fellows. This action, with which we are in full sympathy, is largely due to the persevering action of Mrs. Farquharson, of Haughton, Aberdeenshire. Mrs. Farquharson deserves all credit for her persistent efforts, and it may be that, as the *Daily Chronicle* suggests, she will be "the first lady to be elected to fellowship"; but we can hardly agree with that paper, or with others which from time to time have adopted the same view, that she is "herself a distinguished scientist," or that her "works" "entitle her to a place among the scientific brotherhood." The only work we have seen of hers—*A Pocket Guide to British Ferns* (pp. 96), published in 1881 and noticed in this Journal for that year (p. 350)—scarcely justifies this estimate; the *Chronicle* mentions another on "The Identification of British Mosses" which we have not met with, but which can hardly be of serious importance, as it is neither in the library of the Natural History Museum nor in that of Kew. Nor do we find Mrs. Farquharson's name in the Royal Society's *Catalogue of Scientific Papers*.

The *Journal of the Kew Guild* for 1902, besides a large amount of correspondence from "Old Kewites," contains a portrait and biography of our contributor Mr. J. R. Jackson, for forty-three years Curator of the museums connected with the Gardens.

C E Salmon del.
S C Hendrey lith.

West, Newman imp.

Limonium recurvum.

NOTES ON LIMONIUM.

By C. E. Salmon, F.L.S.

(Plate 449.)

Through the kindness of many botanists, I have lately been enabled to examine numerous fresh and dried examples of the various forms of the plants called *Statice auriculæfolia* Vahl., *S. Dodartii* Gir., *S. occidentalis* Lloyd, and the variety *intermedia* Syme, in our English handbooks.

Of *S. auriculæfolia* Vahl I have not been able to see a type specimen, but Sir J. D. Hooker (Stud. Flora, edit. 3, p. 259) states that "Boissier (who examined Vahl's plant) considered this to be *S. spathulata* Hook. non Desf., and in DC. Prodromus refers it to his *oxylepis*." Boissier, however (*l.c.* xii. 647), considers his *oxylepis* to be identical with *S. densiflora* Guss., a plant which I have not been able to discover in British herbaria.

Under these circumstances, and also taking into consideration that Vahl's own description of *auriculæfolia* (Symb. Bot. i. 25 (1790)) leads one to suppose that under that name he included many forms now separated as species, I would suggest that the retention of the name *auriculæfolia* as an aggregate is of little value, particularly as regards our British forms.

We next come to *Limonium Dodartii* O. Kuntze (*S. Dodartii* Gir.), and it may be helpful to field-botanists (in face of the curt or misleading descriptions of the plant given in our handbooks) to enumerate here the characters of the true plant of Girard. His diagnosis runs (Ann. Sc. Nat. Sér. 2, xvii. 31 (1842)):—"*Statice* foliis spathulato-obovatis, obtusissimis, sæpius mucronulatis, planis, supernè enerviis; scapis rigidis, ramis robustis oblongè paniculatis, spicis subverticalibus, rectis, densifloris; bracteâ exteriore interioris dimidiâ longitudine; calycis limbo obtusissimè 5-dentato; antheris sublinearibus apice loculorumque basi obtusis."

In the minute description that follows, which is too long to quote at length, these additional features seem worthy of note: *Leaves* about 1 in. long, 3–6 lines wide, 1-veined below. *Scape* thick, suberect, internodes scarcely diminished, branched almost from the base. *Branches* subdistichous, very erect, lax, rather thick, lower $\frac{1}{4}$–$2\frac{1}{8}$ in. long, middle shorter, upper almost wanting, simple or sometimes branched, solitary or in twos or threes. *Branchlets* very short. *Spikes* from 2 lines to upwards of an inch long, straight, sometimes solitary, very often close together in twos or threes, slightly diverging. *Outer bract* 1 line long. *Middle bract* as long as exterior. *Inner bract* twice the length of outer, $2\frac{1}{8}$ lines long, scarcely $1\frac{1}{2}$ lines wide, obovate-elliptic or obovate, without a streak of reddish-brown between the membranous and opaque parts. *Bracteoles* 1–$1\frac{1}{2}$ lines long.

Girard also points out that his plant may be distinguished at a glance by the robust rigid branches (none of which are sterile) springing from low down the scape, the very erect, almost vertical,

straight spikes (never horizontal or recurved), and the very obtuse (never acuminate) leaves, and compares *S. Dodartii* with his *S. lychnidifolia*, *S. densiflora* (*L. Girardianum* O. Kuntze), and with *S. spathulata* of Hooker (Brit. Flora, 145 (1830)).

Of the last-named (which is now correctly placed under *L. occidentale*), Girard only examined specimens gathered at the Mull of Galloway (a form noticed later in these notes), which were dwarf examples two or three inches high. He noted that, as compared with his *Dodartii*, the outer bract of these examples was longer and sharper, and the inner bract narrower and almost pointed at the tip, but considered that there were no obvious and specific characters to separate these Scotch plants from *Dodartii*. He consequently named these dwarf specimens *S. Dodartii* var. *humilis*, but two years later gave that name as a synonym of a newly described *S. Bubanii* (Ann. Sc. Nat. Sér. 3, ii. 326 (1844)), which authors agree in considering identical with *L. occidentale* O. Kuntze.

Let us now examine the British records of *L. Dodartii*. In 1849, C. C. Babington published in Ann. Mag. Nat. Hist. 2nd series, iii. 433, a paper upon the British Species of *Plumbaginaceæ*, in which he described *S. Dodartii* Gir., and cited four localities for it in England and Wales. His description of the species is not very satisfactory. Eleven years later he published (*l.c.* v. 402) another paper upon *S. Dodartii*, and stated that, having had the opportunity of seeing a specimen of the genuine French *Dodartii*, he considered the plants from the four British localities mentioned in his previous paper as belonging to *S. occidentalis*, and not to *Dodartii*. He continued :—"But at the same time that the authority for including *S. Dodartii* in the British flora is destroyed, I am enabled to show cause for its restoration to our Catalogue. There has long been an unnamed specimen of *Statice* in my herb., which was gathered at Portland, Dorset, in Sept. 1832, by Prof. Henslow. This is quite similar to the authentic *S. Dodartii* supplied to me by Billot, agrees well with Girard's description, and is exceedingly like the fine old plate of *Limonium minus Bellidis minoris folio* to be found in Dodart's *Mémoires* (ed. 1, p. 95). It is a coarse inelegant plant, of a very different aspect from any state of *S. occidentalis*. The distribution of this plant has to be determined, for it is scarcely to be supposed that Portland is its only English station."

On the strength of this statement *L. Dodartii* is included in our handbooks as a British plant to the present day, though the description given is remarkable. Both Hooker and Babington omit to mention the important leaf character of Girard's species. Hooker describes the branches and spikelets as "spreading"; whilst Babington says, "Stem usually not branched in its lower half." Syme, too, assigns to *Dodartii* the character, "Scapes branched only in the upper half."

These statements are misleading as regards true *L. Dodartii*, but, as an examination of specimens at the British Museum and elsewhere of the Portland plant shows, they fit perfectly well the species gathered in that locality.

Through the kindness of Prof. Marshall Ward and Mr. R. H.

Yapp, I obtained a photograph of the original plant (preserved at Cambridge), mentioned by Babington, and collected in Portland by Prof. Henslow in 1832, and I find exactly the same species from the same locality in the herbaria of many correspondents. I have thus been enabled carefully to examine the plant in question, and I propose to endeavour to show that it may well be kept apart from our other British forms, and from *L. Dodartii*.

The Rev. H. E. Fox collected the Portland plant in 1872, and distributed specimens through the Botanical Exchange Club; upon these examples Mr. J. T. Boswell-Syme reported (Bot. Exch. Club Rep. p. 33 (1872–4)) :—"These specimens have the spikes curiously contracted and dense, but are certainly not the Continental *S. Dodartii*. . . . It must have been some peculiarity of the season which prevented the full development of the plants gathered by Mr. Fox. I fear there is some mistake about *S. Dodartii* occurring in Portland; at all events, that it does not occur there now." As exactly the same habit (dense spikes, &c.) is shown in specimens gathered in the years 1832 (Prof. Henslow's first record), 1833, 1868, 1875, 1876, 1884, 1886, 1888, 1889, and 1895, it would appear that this is the normal appearance of the plant, and was not due to any "peculiarity of season." In 1866 Syme and T. B. Flower (see Eng. Bot. ed. 3, vii. 165) searched for Babington's *Dodartii* in Portland, but found only the common form which Prof. Babington unhesitatingly referred to *S. occidentalis*; this probably was the cause of Syme's last remark on Mr. Fox's plant. It is, however, very possible that Syme and Flower never reached the exact spot on the Portland cliffs that produced the *Statice* Babington had noted, for Mr. J. W. White tells me that it grew over a very restricted area, and that the ordinary *L. occidentale* also occurs on the cliffs about a mile or so away.

The following is a description of the Portland plant, which I consider to be new :—

Limonium recurvum. Folia *anguste obovato-spathulata*, *longe petiolata*, apice obtusa. Scapus *robustus*, *asper*, ramis erecto-patentibus. Spicæ maxime *densifloræ*, patentes, et *patulæ* et *arcuato-recurvæ*, approximatæ apice scapi et ramorum. Spiculæ densæ regulariter distichæ, *bracteis exterioribus spicularum in eadem serie contiguarum imbricatis*. *Bractea interior circiter exteriore sesquilongior*. Bractea media exteriore perspicue brevior.

Plant small, from 4 to 6 inches high, rarely 9. *Leaves* usually more or less scaly, remarkably constant in outline, narrowly obovate-spathulate, obtusely pointed or rounded, with petioles about as long as blades, apiculate or not; from 1 inch long by 2 lines wide to $1\frac{3}{4}$ inches long by 4 lines wide; 1-veined, not visible on upper surface but distinct below, where there are rarely traces of two other veins. *Scape* rough with asperities and remarkably stout, thicker above than below, branched usually below the middle though occasionally near summit only. *Branches* short, ascending-spreading, either all flowering or with few lower sterile. *Branchlets* very short or wanting. *Scales* triangular-acute, the larger ones with long acuminate points; varying in size from 4 lines at base

of scape to 1 line at summit, never foliaceous. *Spikes* usually subsessile, remarkably dense-flowered and stout, ascending-spreading, horizontal and arcuate-recurved, very congested at ends of branches and scape, often forming a cross; spikes conspicuously pointed in bud. *Spikelets* 1–3-flowered (with often one of the flowers rudimentary), arranged very regularly and closely in two rows, and so compressed that the outer bracts of the same row are distinctly imbricate. *Outer bract* 1½–1¾ lines long, broadly ovate-acute, with an opaque central portion and broad membranous margin; latter often with dark line near opaque part. *Middle bract* 1⅛–1⅜ lines long, always falling short of outer bract, membranous, obovate-oblong, tip bluntish toothed or bilobed, 2-veined, one much the stronger. *Inner bract* 2¼–2½ lines long, never approaching twice the length of the outer bract and usually only half as long again, broadly oblong-obovate, rounded at tip or slightly pointed, with an opaque central portion and broad membranous margin; latter sometimes with dark line near opaque part. *Bracteole* 1¾–1⅞ lines long, usually one less in number than the flowers in a spikelet, membranous, narrowly obovate-oblong, tip slightly bifid or toothed, bluntish, more or less gibbous with one non-central vein. *Calyx* sparsely hairy in the lower portion with appressed hairs, otherwise glabrous, veins of calyx-lobes long and acute.

L. recurvum may be easily recognized by the very stout and robust appearance of scape and spikes, by the latter being very spreading and arcuate, and by the leaves being always rather small and narrow, long-petioled and bluntly pointed. From *L. Dodartii* it may be distinguished by its narrow leaves, spreading, horizontal, and recurved spikes; from *L. occidentale* by its robust habit, stout scape, and dense recurved spikes; and from both by its bracts.

The original habitat in Portland Island appears unfortunately to be now destroyed. Mr. J. W. White kindly visited the locality for me last summer where he had in previous years collected it, and reported that a quarrying firm had recently totally destroyed the cliff-face where the plant used to grow, and he could see no signs of a single example. This is much to be regretted, as, with the exception of a very doubtful plant in the herbarium of Mr. A. Bennett, collected by Mr. J. E. Griffith on the coast of Anglesea, Portland is the only locality from which I have seen *L. recurvum*. It is to be hoped that it may be rediscovered on another part of the Portland cliffs, or in other localities on our coasts; but I have failed to discover specimens of it from the coast of France, Portugal, Spain, Belgium, Holland, Denmark, Norway, or Sweden, in various European herbaria examined.

We next come to the species *L. occidentale* O. Kuntze, to the forms of which so many names have been given by various authors, and which is particularly puzzling from its variability.

As a British plant—or indeed as a separate species at all—this seems to have been first noticed by Gerard (*Herbal*, 333) as early as 1597, who figures the plant, calls it *Limonium parvum* (Rocke lavender), and says: "The smal kinde I could never finde in any

other place, but upon the chalkie cliffe going from the towne of Margate downe to the sea side, upon the left hand." There are specimens of this plant at the British Museum collected by Samuel Dale at Dover in 1718, and at Ramsgate in 1721; but they are forms of the same species, and both *L. occidentale*. There is also a specimen of *L. occidentale* in Herb. Rand at the British Museum, labelled *Limonium parvum*, with the locality, "Beach below Sheerness." Rand died in 1743. In 1829 it was again noted in Kent by the Rev. G. E. Smith (Cat. Pl. S. Kent, p. 18, t. 2), who described and figured it from that coast, identifying it with *S. cordata* Willd. (Sp. Plant.), and contrasting it carefully with *S. Limonium*, with which, up to that time, it had evidently been confounded. In 1831 G. E. Smith discovered that his plant was certainly not the *cordata* of Willdenow and re-named it *S. binervosa*, and gave an excellent account and plate of it in Eng. Bot. Supp. (t. 2663) published in that year, contrasting it not only with *S. Limonium*, but with nearer allied species.

In 1844 J. Lloyd, in his *Flore de la Loire-Inférieure*, described what he considered a new *Statice*, under the name *occidentalis*, from the rocks of Bourgneuf à Lorient, Belle-Ile. The description given is somewhat brief and no *minute* differences mentioned between it and other allied forms. I have seen specimens of Lloyd's plant at Kew and elsewhere, and there is no doubt that his *occidentalis* and Smith's *binervosa* represent the same species.

It is to be regretted that the specific name *binervosa* cannot be retained for this plant under the genus *Limonium*, as Smith's description, besides antedating Lloyd's, is far more detailed; but Dr. Otto Kuntze has already adopted the name *occidentale*.

Syme (Eng. Bot. ed. 3, vii. 163) arranges this plant as follows: *S. binervosa* G. E. Smith, with segregates, α *occidentalis* Lloyd; β *intermedia*; γ *Dodartii* Gir. Of *occidentalis* he says, "Scape branched often from below the middle; lower branches sometimes sterile; spikes ascending or erect, rather slender." Of his own variety β *intermedia* he writes: "Scape branched from the middle or from above the middle, rarely below it; rarely a few of the lower branches sterile; spikes spreading or spreading-ascending, thick."

Corbière (Fl. Normand. 480 (1894)) notes that *S. occidentalis* varies greatly, and remarks that when growing on cliffs it is slender, with a rather narrow lax panicle (f. *elongata*), whilst the sandy or salt-marsh plant is relatively thick-set, with a spreading panicle, almost a corymb (f. *compacta*).

At first I was strongly inclined to retain the variety *intermedia* of Syme (f. *compacta* of Corbière—they are evidently synonyms), and attempted to place under it, by the help of Syme's characters, numerous specimens from various parts of Britain; but as the number increased, so the difficulties also became greater, and at last I found it impossible to sort them thus with any degree of satisfaction. There were innumerable forms showing every possible variation of branching, sterility, or angle of branches or spikes, and, short of a plan of describing *individuals*, I found it impossible to keep the variety apart.

The majority of our British forms of *L. occidentale* fall midway between Syme's two segregates *α* and *β*, and specimens named *β* "*intermedia*" by him that I have examined show many variations towards his description of *α occidentalis*, and dissection showed nothing whereby the bracts, &c., differed one from the other.

Almost every locality for *L. occidentale* in Britain seems to possess a form slightly different from the plants in another locality. *Some* of the specimens from one locality may show an approach to those from another, but the main body from any one station usually possesses distinguishing characters, so that with a little practice one may sort them according to localities. For instance, it is always easy to separate the Cuckmere Gap (Sussex) or Dover (Kent) chalk-cliff plant from the Knott End (Lancashire) or Newquay (Cornwall) form. The former is a tall, rather slender, much-branched plant, sometimes almost two feet high; the scape is branched from near the base, with the branches long, ascending, and often overtopping those above; it has many sterile branches, and its leaves are long, rather narrow, and more or less acutely pointed. The latter is usually a stouter plant, about a foot high or less, with a scape unbranched near its base; the branches are shorter, more or less spreading, and do not overtop those above; sterile branches are absent, and the leaves are broader and mostly obtusely pointed.

If, however, an attempt is made to sort a large series of the various forms in this way, all the characters mentioned above must be prefixed by the word "usually," and the unsatisfactory nature of the arrangement soon becomes apparent. For instance, one would be at a loss to know where to place the Sea Lavender that grows in Glamorganshire, the scape of which is either branched at the base or near the summit only, and in which sterile branches are present or not. Dorset specimens show the same variation, and here also the branches either overtop, or fall short of, those above, and the leaves are broad and bluntish, or narrower and more acute. This form, again, differs from the sandy salt-marsh plant of Norfolk in many respects, and other numerous examples might be given to show that there exists a complete chain of intermediates between each apparently distinct local form, so that it becomes evident that it is impossible to draw hard and fast lines between even the Kent or Sussex and Lancashire or Cornwall plants mentioned above.

It would obviously be useless to give names to all these forms occurring on our coasts—forms no doubt occasioned by situation, soil, and surroundings—and I therefore propose to include them all (with one or two exceptions) under *L. occidentale* O. Kuntze. This idea has been strengthened by finding a specimen in Mr. F. Townsend's herbarium labelled *S. occidentalis* by Lloyd, from Morbihan, France, which would well come under the *β intermedia* of Syme (or the Lancashire and Cornwall plant); whilst a *similarly* labelled specimen in the Kew collections would fit Syme's idea of *α occidentalis* (or the Kent and Sussex plant). I am unable, as Corbière has suggested may be done in Normandy, to sort satis-

factorily the cliff-form (f. *elongata*) from the marsh plant (f. *compacta*) by the characters he gives, or by any others.

I give below a description of *L. occidentale*, drawn up from an examination of Lloyd's and G. E. Smith's specimens, with the help of fresh material from various parts of England.

LIMONIUM OCCIDENTALE O. Kuntze. Folia formâ et magnitudine maxime variabilia, nunc anguste lanceolato-obovata nunc late obovato-spathulata, apice acuta vel obtusa. Scapus gracilis vel robustiusculus, plus minus levis. Rami omnes floriferi vel inferiores steriles, erecti vel erecto-patentes. Spicæ erectæ vel erecto-patentes, longæ angustæ vel breviores et tunc crassæ. Spiculæ plerumque laxius distichæ, interdum densiores et tunc bracteis exterioribus contiguis sed non imbricatis. Bractea interior exteriore circiter duplo longior. Bractea media exterioris longitudine vel eâdem paulo brevior.

Plant very variable in height, from 6 to 18 inches high. *Leaves* remarkably variable in size and shape, from narrowly lanceolate-obovate to broadly obovate-spathulate; from 1 to 4 inches long and from 2 to 7½ lines wide (though rarely so wide), tapering to an acute or obtuse point (rarely almost rounded), apiculate or not; petioles longer or shorter than blades; 1–3-veined (rarely 5). *Scape* slender or rather stout, smooth (usually tapering from the base upwards), branched at, below, or above the middle. *Branches* long or short, strictly ascending or more or less spreading, all flowering or lower sterile. *Branchlets* many or few. *Scales* triangular-acute, the larger ones with long acuminate points; varying in size from 6 lines at base of scape to 1 line at summit; never foliaceous. *Spikes* ascending or ascending-spreading; long and narrow and loose-flowered or shorter, thicker and rather dense-flowered. *Spikelets* 1–4-flowered (with often one of the flowers rudimentary), arranged usually rather laxly in two rows, sometimes more compressed but outer bracts of same row never imbricate. *Outer bract* 1–1⅝ lines long, sometimes tinged with purple, broadly ovate-acute, with an opaque central portion and broad membranous margin; latter often with dark line near opaque part. *Middle bract* ¾–1⅜ lines long, equalling or slightly falling short of outer bract, membranous, obovate-oblong, tip bluntish toothed or bilobed (rarely almost entire), 2-veined, one much the stronger. *Inner bract* 1¾–2¾ lines long, usually not quite twice the length of the outer bract (rarely, just exceeding twice its length), sometimes tinged with purple, orbicular- (or oblong-) obovate, rounded at tip or slightly pointed, with an opaque central portion and broad membranous margin; latter sometimes with dark line near opaque part. *Bracteole* 1½–2¼ lines long (usually about 2 lines), usually one less in number than the flowers in a spikelet, membranous, narrowly obovate-oblong, tip irregularly toothed, bluntish, more or less gibbous with one non-central vein. *Calyx* slightly (sometimes copiously) hairy with appressed or ascending hairs, chiefly on the veins, irregularly so on the same calyx; veins of calyx-lobes long and acute, glabrous.

In looking over a large number of specimens in various Herbaria, I was much struck with a fine Sea lavender gathered by many botanists in North Wales, and a closer examination revealed several points of interest.

It may be convenient to distinguish this remarkable plant as var. PROCERUM of *L. occidentale*, and it may be separated from the latter by the following characters.

The greater height (12–19 inches), strong habit, and the larger size of all its parts.

Scape branched only near the summit, or rarely at about the middle. *Leaves* remarkably large, though varying in shape; 2–3½ inches long and never very narrow, obtusely pointed or even rounded, 6–12 lines wide, 3–5-veined, usually 5. *Branches* rather short, all flowering. *Spikes* remarkably dense and stout, ascending or spreading-arcuate. *Spikelets* larger, 3–4 lines long.

In the younger and smaller examples the same peculiarities are observable in a modified degree.

The synonymy and distribution in Britain of the plants mentioned above are as follows :—

LIMONIUM RECURVUM.

Statice Dodartii, Bab. (non Gir.) Man. Brit. Bot. ed. v. to viii.

9. *Dorset*. Portland! 1832, Prof. Henslow. 1895, J. W. White & G. C. Druce.

L. OCCIDENTALE O. Kuntze.

Limonium parvum Gerard, Herbal, p. 333 (1597).

L. minus maritimum nostras Pluk. Alm. 220, Raii Syn. ed. 3, p. 202 (1721).

Statice cordata G. E. Sm. (non Willd.), Cat. Pl. South Kent, p. 18, t. 2 (1829).

S. spathulata Hooker (non Desf.), Brit. Fl. p. 145 (1830).

S. binervosa G. E. Sm., Eng. Bot. Supp. t. 2663 (1831).

S. occidentalis Lloyd, Fl. Loire-Inf. p. 212 (1844).

S. Bubanii Girard, Ann. Sci. Nat. Sér. 3, vol. ii. p. 326 (1844).

S. Dodartii Bab. (non Gir.), Man. Brit. Bot. ed. 3 and 4.

S. binervosa G. E. Sm. *β intermedia* Syme, Eng. Bot. ed. 3, p. 164 (1867) (pro parte).

1. *Cornwall West*. Whitsand Bay! 1835. Ex herb. C. A. Johns. (Herb. Kew.)—2. *Cornwall East*. Perranzabuloe Porth! 1845. (Herb. Trin. Coll. Dublin.)—3. *Devon South*. Seaton! 1832. Mrs. J. Thompson. (Herb. C. E. S.)—4. *Devon North*. Instow! 1830. E. Forster. (Herb. Borrer.)—5. *Somerset North*. Worle Hill! 1830. W. Christy. (Herb. Watson.)—9. *Dorset*. Lulworth! 1837. Woods. (Herb. Linn. Soc.)—14. *Sussex East*. Beachy Head! 1835. J. Macnab. (Herb. Edinburgh).—15. *Kent East*. Dover! 1718. S. Dale. (Herb. Brit. Mus.)—*18. *Essex South*. Southend! H. Baber, "Recd. 1836." (Herb. Edinburgh.) —*19. *Essex North*. Clacton-on-Sea! 1885. W. Whitwell.—27. *Norfolk East*. Cley! 1834. C. C. Babington. (Herb. Borrer.)—28. *Norfolk West*. Lynn! 1779. Herb. Smith. (Herb. Linn. Soc.)

—41. *Glamorgan.* Oystermouth, Swansea! 1848. J. Ball. (Herb. Watson.)—44. *Carmarthen.* Pendine! 1879. H. L. Jones. (Herb. Brit. Mus.)—45. *Pembroke.* Tenby! 1836. Ex herb. E. Lees. (Herb. Edinburgh.)—48. *Merioneth.* No personal authority. (Top. Bot.)—49. *Carnarvon.* Llandudno! 1828. N. J. Winch. (Herb. Linn. Soc.)—*51. *Flint.* Flintshire coast! Ex herb. H. Ibbotson. (Herb. Brit. Mus.)—52. *Anglesea.* Aberffraw! 1828. W. Wilson. (Herb. Kew.)—54. *Lincoln North.* Saltfleet! 1876. W. Fowler. (Herb. Brit. Mus.)—58. *Cheshire.* Hilbre Island! 1861. F. M. Webb. (Herb. Watson.)—60. *Lancashire West.* Fleetwood-on-Wyre! 1841. (Herb. Watson.)—69. *Lake Lancashire.* Between Greenodd and Tridley! E. Hodgson. (Herb. Brit. Mus.)—70. *Cumberland.* St. Bees Head! 1838. Ex herb. J. Dickinson. (Herb. Edinburgh.)—*71. *Man.* G. A. Holt (*fide* A. Bennett.)—74. *Wigtown.* Galloway! 1823. Goldie. (Herb. Kew.)

L. OCCIDENTALE var. PROCERUM.

Statice binervosa G. E. Sm. *β intermedia* Syme, Eng. Bot. ed. 3, p. 164 (1867) (pro parte).

49. *Carnarvon.* Llandudno! 1832. Jn. Roberts. (Herb. Borrer). Great Ormes Head! 1857. C. E. Parker. (Herb. Edinburgh.) Same locality! 1891. G. E. Martindale. (Herb. Trin. Coll. Dublin.)

For the county records under *L. occidentale* I have noted the earliest occurrences for the plant from herbarium specimens examined; for its var. *procerum* and for *L. recurvum* the earliest and also the most recent gatherings seen are recorded. County records additional to those in Watson's Top. Bot. are marked *.

As regards the occurrence of *L. occidentale* in Scotland, it is only known, at present, from one locality in one county, Wigtown, and the form that occurs there is so different in appearance—and seems constant, too, in such differences—from our usual English or Welsh plants that it may, perhaps, have to be separated as a variety.

I have not yet had an opportunity of examining fresh plants, but all the dried examples that I have seen are slender plants (usually about 6–9 inches high), producing small, narrow, bluntish, and long-petioled leaves, low-branched scapes with many erect branches (the lower sterile), and long, narrow, and usually strictly-erect spikes. The comparatively small and narrow leaves on quite large plants (10–15 inches high) form a striking feature, and this peculiarity appears constant in some ten or twelve sheets of specimens examined, gathered by various botanists between the years 1823 and 1890. This plant is occasionally represented in herbaria by very dwarf examples, with the scape corymbosely-panicled; such specimens (2–3 inches high) Girard named "*S. Dodartii* Gir. var. *humilis*," as mentioned previously. This Scotch plant is also the origin of the *S. reticulata* of Hooker (Fl. Scotica, p. 97 (1821)); the locality for this reads, "Mull of Galloway. Mr. Goldie," and there are specimens of Goldie's collecting in the Herbarium at Kew. These are exactly identical with the dwarf form mentioned previously, and give one no idea of the size this reaches in more favourable situations in the same locality.

L. occidentale is reported for Ireland from eleven divisions in Praeger's Irish *Topographical Botany* (1901), but I have only examined examples from Wicklow, Waterford, Dublin, and Clare. It appears to be absent from the north-east coasts. It grows in many parts of Jersey and Guernsey, and in Alderney and Sark, and I have seen specimens from these islands.

Description of Plate 449.

Limonium recurvum, natural size, drawn from Portland specimens. 1. Outer bract. 2. Middle bract. 3. Inner bract. 4. Bracteole. 5. Calyx. All enlarged four times.

NOTES ON FRESHWATER ALGÆ.—III.

By W. West, F.L.S., and G. S. West, M.A., F.L.S.

(Concluded from p. 41.)

35. Closterium pusillum Hantzsch. in Rabenh. Alg. Eur. no. 1008, 1861; Rabenh. Flor. Europ. Algar. iii. 1868, p. 125.

Var. monolithum Wittr. in Wittr. & Nordst. Alg. Exsic. 1886, no. 836. Long. 29·8–40·4 μ; lat. 7·5–8·6 μ.

Hab. Gurnard's Head, Cornwall, on damp ground.

36. C. macilentum Bréb. Long. 722 μ; lat. 13·5 μ.

Hab. Near Mullion, Cornwall.

37. C. pronum Bréb. *Hab.* Glyder Fach, N. Wales, at 2200 ft. Near Mullion, Cornwall.

38. Euastrum crassum (Bréb.) Kütz. var. scrobiculatum Lund.

Hab. Moel Siabod, N. Wales.

39. E. aboense Elfv. *Hab.* Capel Curig and Llyn-y-cwm-ffynon, N. Wales.

40. E. lobulatum Bréb. *Hab.* Bog above Capel Curig; Glyder Fach, at 2200 ft.; near Llyn Idwal, N. Wales. Near St. Just; near Senens; near Land's End; Tremethick Moor, Cornwall.

41. Xanthidium Smithii Arch. *Hab.* Moel Siabod, N. Wales.

42. X. armatum (Bréb.) Rabenh. var. cervicorne West & G. S. West. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

43. Cosmarium Lundellii Delp. *Hab.* Mousehole Cave, Cornwall.

44. C. pseudexiguum Racib. *Hab.* Moel Siabod, N. Wales.

45. **C. quadrimamillatum**, sp. n. (Pl. 446, fig. 12.) C. parvum, circiter tam longum quam latum vel paullo latius quam longum, profunde constrictum, sinu angusto-lineari extremo ampliato; semicellulæ transverse subrectangulares vel elliptico-rectangulares, angulis basalibus leviter rotundatis, lateribus leviter concavis, subparallelis vel sursum subdivergentibus, angulis superioribus minute et distincte mamillatis, apicibus latis elevatis et leviter subconvexis; in centro semicellularum cum granulo singulo et intra mamillam unamquamque cum granulo parvo singulo; a vertice visæ ellipticæ,

granulo distincto ad medium utrobique et granulo singulo ad laterem unumquemque polorum ; a latere visæ subglobosæ granulo singulo ad medium utrobique ; pyrenoidibus singulis. Long. 23–24 μ ; lat. 23–27·5 μ ; lat. isthm. 7·7–8·6 μ ; crass. 13·5 μ.

Hab. Near the Lizard, Cornwall, in ditches.

This *Cosmarium* was abundant from several of the collections in the above neighbourhood, and we have never observed it from any other part of the British Islands.

46. C. ABBREVIATUM Racib. *Hab.* Llyn-y-cwm-ffynon, Llyn Ogwen, N. Wales ; near Crowan, Cornwall.

47. C. PYGMÆUM Arch. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

48. C. SPHAGNICOLUM West. & G. S. West. *Hab.* Llyn Bochlwyd, N. Wales.

49. C. SYNTHIBOMENUM West. *Hab.* Llyn Idwal, N. Wales.

50. C. CYCLICUM Lund. *Hab.* Llyn Idwal, N. Wales.

51. C. SUBUNDULATUM Wille. *Hab.* Llyn Idwal, N. Wales.

52. C. ETCHACHANENSE Roy et Biss. *Hab.* Moel Siabod, Llyn Idwal, Llyn Cwlyd, N. Wales.

53. C. COSTATUM Nordst. *Hab.* Llyn Idwal, N. Wales.

54. C. COMMISSURALE Bréb. Long. 29·5–33 μ ; lat. 42–45 μ ; lat. isthm. 9·6–12 μ ; crass. 24–25 μ ; diam. zygosp. sine spin. 40–42·5 μ, cum spin. 75–83 μ.

Hab. Pools near St. Just, Cornwall ; abundant with zygospores.

We have never met with this species in abundance from any part of the British Islands except Cornwall. It seems generally distributed in the western districts of that county.

55. C. TRACHYPLEURUM Lund. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

56. C. ORTHOSTICHUM Lund. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

57. C. PSEUDOBROOMEI Wolle. *Hab.* Llyn-y-cwm-ffynon, Capel Curig, N. Wales.

58. C. ANNULATUM (Näg.) De Bary var. ELEGANS Nordst.
Hab. Moel Siabod, N. Wales.

59. COSMOCLADIUM SAXONICUM De Bary. *Hab.* Capel Curig, N. Wales.

60. SPONDYLOSIUM PAPILLOSUM West & G. S. West. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

61. STAURASTRUM ARISTIFERUM Ralfs. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

62. S. LONGISPINUM (Bail.) Arch. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

63. S. SUBAVICULA West & G. S. West. *Hab.* Glyder Fawr, N. Wales.

64. S. AVERSUM Lund. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

65. S. KJELLMANII Wille. *Hab.* Glyder Fawr, N. Wales, at 2700 ft.

66. S. PILEOLATUM Bréb. var. BRASILIENSE (Börg.) Lutkem. [*S. amœnum* Hilse var. *brasiliense* Börg.] *Hab.* Glyder Fach, N. Wales, at 2200 ft.

67. S. SCABRUM Bréb. *Hab.* Moel Siabod, Llyn-y-cwm-ffynon, Llyn Bochlwyd, N. Wales.

68. S. ERASUM Bréb. *Hab.* Glyder Fach, N. Wales, at 2200 ft.

69. **S. echinodermum,** sp. n. (Pl. 446, fig. 13.) S. parvum, paullo longius quam latum, profunde constrictum, sinu aperto acutangulo; semicellulæ angulato-ellipticæ, angulis subtruncatis, dorso valde convexo, angulis et dorso spinis brevibus geminatis circiter 8 ornatis, seriebus duabus transversis spinarum trans semicellulam unamquamque; a vertice visæ quadrangulares vel pentagonæ, lateribus levissime concavis, angulis acute rotundatis, marginibus spinis brevibus obsessis, intra marginem unumquemque spinis geminatis 2. Long. s. spin. 31·5 μ; lat. s. spin. 27 μ, cum spin. 30·8 μ; lat. isthm. 10·5 μ.

Hab. Glyder Fawr, N. Wales, at 2700 ft.

70. S. COSMOSPINOSUM (Börg.) West & G. S. West. *S. rostellum* Roy et Biss.

Hab. Capel Curig, N. Wales.

71. S. GRANULOSUM (Ehrenb.) Ralfs Brit. Desm. 1848, p. 217; West & G. S. West in Trans. Roy. Irish Acad. 1902, f. 45, t. ii. f. 24; *Desmidium granulosum* Ehrenb. 1839; *Phycastrum granulosum* Kütz. Spec. Algar. 1849, p. 180. *S. lunatum* Ralfs var. *subarmatum* West in Journ. Roy. Micr. Soc. 1894, p. 10, t. ii. f. 47. Zygosporæ globosæ, spinis longis delicatulis obsessæ, apicibus spinarum latissime bifurcatis. Diam. zygosp. sine spin. 32·5–34·5 μ, cum spin. 62–65 μ; long. spin. 13·4–15·5 μ.

Hab. Near Crowan, Cornwall.

Roy and Bissett have figured the zygospore of *S. granulosum* from Scotland; but the figure is very indistinct, and specifically unrecognizable.

72. S. BRACHYCERUM Bréb. *Hab.* Llyn Idwal, N. Wales; near Senens, Cornwall.

73. S. ANATINUM Cooke & Wills. *Hab.* Llyn-y-cwn-ffynon, N. Wales.

74. S. VESTITUM Ralfs. *Hab.* Llyn-y-cwm-ffynon, N. Wales; St. Just, Cornwall.

75. S. ARCTISCON (Ehrenb.) Lund. *Hab.* Llyn Ogwen, N. Wales.

76. S. OPHIURA Lund. *Hab.* Llyn Ogwen, N. Wales.

The specimens were almost typical. *S. Ophiura* var. *cambricum* is known to occur abundantly at Capel Curig.

77. S. ARACHNE Ralfs. *Hab.* Llyn-y-cwm-ffynon, N. Wales.

78. CONFERVA AFFINIS Kütz. C. in cæspitibus, densissimis, flavo-brunneis; filis angustis; cellulis diametro 9–14-plo longioribus, cylindricis; chromatophoris 1–3, parietalibus et irregularibus, sine pyrenoidibus; membrana cellularum tenui sed firma. Crass. fil. 5–5·4 μ. (Pl. 446, figs. 14–17.)

Hab. South of Helston, Cornwall; St. Mary's, Scilly Islands.

This species appears to be not uncommon in some parts of the British Islands. The filaments are very narrow, and the cells very long. The cell-walls are somewhat thin, but they break up in precisely the same manner as in other species of the genus. The chromatophores are more irregular than in any other species of *Conferva*, and vary in number from one to three. They are parietal, extremely thin, of a pale yellow-green colour, and possess very irregular margins. Pyrenoids are absent. The terminal cell of a filament is sometimes produced out into an exceedingly fine hair-like point. We have also met with this plant in Yorkshire and the Lake District, usually in fairly pure masses in peaty pools.

79. **C. obsoleta,** sp. n. (Pl. 446, figs. 18–21.) C. in cæspitibus densis, flavo-viridibus; cellulis robustis, diametro 1–1¾-plo longioribus, cylindricis; chromatophoris parvis, circularibus vel ellipticis, parietalibus, numerosis, sine pyrenoidibus; membrana cellularum firma. Crass. fil. 19–21 μ; diam. aplanospor. 16 μ.

Hab. Near Penzance, Cornwall; St. Mary's, Scilly Islands.

This plant is of the same size as *Microspora amœna*, and the cells are of the same proportions. The parietal chromatophores are very small and numerous, and are closely fitted all over the interior of the cell-wall. There is a globular nucleus situated in the protoplasmic lining of the cell, which readily stains with alum-carmine or hæmatoxylin. The filaments frequently form aplanospores, which are globular with firm cell-walls, and which possess a considerable number of irregular parietal chromatophores. Only one aplanospore is formed in a single cell, and it escapes by the disarticulation of the walls of the mother-cell. In mass, this species is of a slightly darker colour than *C. bombycina*, this fact being most noticeable in dried specimens.

80. **Bumilleria pumila,** sp. n. (Pl. 446, figs. 22, 23.) Cellulæ parvæ, subquadratæ vel oblongo-quadratæ, filum simplicem in vagina mucosa inclusum formantes; chromatophoris parvis disciformibus parietalibus 8–10, pyrenoidibus carentibus. Diam. cell. 4·8–5·7 μ; long. cell. 5–6 μ.

Hab. Near Senens, Cornwall.

This is a much smaller species than *Bumilleria sicula* Borzi (Studi Algologici, ii. Palermo, 1895, p. 186, t. xvi. et xvii.). The cells are also more quadrate and less closely connected together, the latter feature being due to the presence of a considerable enveloping mucus. The chromatophores are smaller and more numerous than in *B. sicula*, but their parietal disposition is precisely similar, and they are destitute of pyrenoids. The cell-walls are extremely delicate. The alga was observed in considerable abundance, and it is the first recorded instance of the occurrence of the genus in Britain.

81. Characiopsis minuta (A. Br.) Borzi. *Characium minuta* A. Br. Long. cell. 17–18 μ; lat. cell. 5·5 μ.

Hab. Near Penzance, Cornwall.

82. **C. turgida,** sp. n. Cellulis vegetativis ovato-ellipsoideis vel oblongo-ellipsoideis, apicibus acuminatis vel subacuminatis,

stipite brevi angusto cum disco basali; chromatophoris pluribus (8–21 ut visis) parietalibus et irregulariter laminæformibus, pyrenoidibus carentibus. Zoogonidiis . . . . ? Long. cell. 36–46 μ; lat. cell. 11·5–16 μ.

Hab. Keighley Moor, W. Yorkshire; Sheep's Green, Cambridge.

This species has already been recorded under the name of "*Characium* sp." (cfr. Journ. Bot. 1899, p. 222, t. 395, f. 7; Trans. Yorks. Nat. Union, part 25, July, 1901, p. 127). It differs from other species of *Characiopsis* in its larger, more turgid vegetative cells, and in its more numerous chromatophores.

CHLOROBOTRYS Bohlin, 1902; char. emend.

We have long had this alga described as a new genus. The following diagnosis was written months before Bohlin's description appeared, and as it is rather more complete than his, we publish it under his name of *Chlorobotrys*:—Cellulæ sphæricæ vel subsphæricæ, singulæ vel 2–4–8–16 consociatæ; familiæ in tegumento hyalino pellucidissimo et non-lamelloso inclusæ; membrana cellularum silicea, subcrassa, firma et homogena; chromatophoris parietalibus disciformibus 6–30, sine pyrenoidibus; sæpe cum puncto rubro in cellula unaquaque. Propagatio cellularum divisione primum in duas demum in tres directiones alternans.

83. CHLOROBOTRYS REGULARIS (West) Bohlin in Bihang till K. Sv. Vet.-Akad. Handl. Bd. 27, no. 4, 1902, p. 34, t. i. f. 9. [*Chlorococcum regulare* West in Journ. Roy. Micr. Soc. 1892, p. 737, t. x. f. 55; *Glœocystis regularis* West & G. S. West.] Character idem ac generis. Diam. cell. 12–19 μ; diam. fam. cum integ. 34–90 μ. (Pl. 447, figs. 7–10.)

Hab. Generally distributed through all the *Sphagnum*-bogs in the British Islands.

We have long had this alga under observation as one which had apparently escaped notice in spite of its great abundance and wide distribution. We first referred it to the genus *Chlorococcum*, and afterwards provisionally to the genus *Glœocystis*, which is now constituted to include *Chlorococcum*. Closer examination has shown that it belongs to Borzi's order "Confervales." The cells are more or less globose, and occur singly, or in twos, fours, eights, sixteens, &c., each family being embedded in an exceedingly delicate, transparent, homogeneous mucus. The cell-walls are firm, smooth, of some considerable thickness, and composed of silica. The chromatophores, which are parietal yellow-green discs devoid of pyrenoids, vary considerably in number. In some cells a prominent red pigment-spot is present, but in others this is quite absent.

Chlorobotrys is undoubtedly nearest to Borzi's genus *Botrydiopsis*, but differs in its smaller size, its colonial habit with more or less regularly arranged cells, its enveloping mucous integument, and in its habitat. *Botrydiopsis arhiza* inhabits running water, but *Chlorobotrys regularis* is only found in bogs.

Multiplication takes place by the division of the cells primarily in two directions, but afterwards in three directions. Families of 4, 8, or 16 cells are therefore frequently very symmetrical; beyond

this number they become irregular. Zoogonidia have not been observed.

84. Centrosphæra Facciolaæ Borzi, Studi Algologici, i., Messina, 1883. Diam. cell. veget. 26–42 μ.

Hab. Near Senens, Cornwall.

This interesting genus has not previously been recorded from the British Islands. The plants are unicellular with thick lamellose cell-walls, from one side of which projects a lamellose excrescence. They occurred in abundance attached to the submerged leaves of aquatic plants, but only ordinary vegetative cells were observed.

85. Conochæte comosa Klebahn in Pringsh. Jahrb. f. wissen. Bot. Bd. xxv. 1893. Diam. cell. 13–14 μ. (Pl. 448, fig. 5.)

Hab. New Forest, Hants.

Each cell was globular, with two pale green parietal chromatophores and a large oil globule. There were five bristles to each cell, and five strong sheaths of considerable length. Klebahn's original form did not appear to possess more than three bristles to each cell, but otherwise the plants are very similar.

Polychætophora, gen. n.

Thallus minutus, e cellulis paucis formatus, subfilamentosus vel interdum unicellularis; cellulis subglobosis, ellipsoideis vel ovoideis, membrana crassissima valde lamellosa; cellula unaquaque setis longis flexuosis simplicibus non vaginatis 8–12 instructa; chromatophoris singulis parietalibus, sæpe indistinctis, cum pyrenoidibus singulis ?

86. **Polychætophora lamellosa,** sp. unica. (Pl. 448, figs. 1–4.) Character idem ac generis. Diam. cell. 19–35 μ; crass. cell. membr. 2·8–10·5 μ; long. set. 86–183 μ.

Hab. In pond, Botanical Garden, Cirencester, Gloucestershire; amongst *Tolypothrix pygmæa.*

This plant is characterized by the thick lamellose cell-walls, which are furnished on their outer surface with a number of long flexuose bristles. The number of bristles attached to the wall of each individual cell varies from eight to twelve. The bristles are delicate, attenuated to fine points, quite simple and devoid of sheaths. The cells are sometimes solitary, and there is frequently an unequal development of the cell-wall, a large lamellose outgrowth being present on one side. This feature gives almost a stalked appearance to such a cell, and the growth greatly resembles that present in *Hormotila* Borzi. More often the cells occur in short irregular filaments of six or eight cells. The chromatophores are bright green and very difficult of observation; they are parietal, but frequently develop large globules of an oily consistency which entirely fill the cell. The presence of this material renders the detection of pyrenoids very difficult.

Perhaps the nearest genus to *Polychætophora* is *Myxochæte* Bohlin (in Bih. till K. Sv. Akad. Handl. Bd. 15, Afd. iii. 1894), from which it is readily distinguished by the few cells of the thallus, which is subfilamentous or even unicellular, by the much larger

number of bristles attached to each cell, and by the thick lamellose cell-walls.

The genus *Conochæte* Klebahn (1893) also bears a certain amount of resemblance to *Polychætophora*, but the nature and arrangement of the bristles, which are sheathed, are very different.

87. Euastropsis Richteri (Schmidle) Lagerh. in Tromsö Museums Aarshefter 17, 1894, p. 20, t. i. f. 8–27. *Euastrum Richteri* Schmidle. Long. cœnob. 10·8–13·2 μ; long. cell. 4·5–6 μ; lat. cell. 7·8–8 μ.

Hab. Near Senens, Cornwall, amongst other algæ.

This interesting plant has only previously been found in Germany (by Schmidle in 1893) and in Norway (by Lagerheim in 1894).

88. Hariotina reticulata Dang. 'Mémoire sur les Algues,' Le Botaniste, 1889; Chodat et Huber in Bull. Soc. Bot. France, tom. xli. 1894. Diam. cell. 9–13 μ.

Hab. Churchill, Co. Donegal, Ireland.

This interesting alga approaches nearer to *Cœlastrum* Näg. than to any other genus of the *Protococcoideæ*. The cells are globose, and each one is enveloped in a delicate hyaline membrane, which sends off thin delicate prolongations. The cells are connected together by means of these prolongations, forming colonies of a variable number of cells. The enveloping cell-wall is much more delicate than in *Cœlastrum*, and the young autocolonies are retained as parts of the original colony, whereas in the latter genus they are generally set free.

Ineffigiata West & G. S. West, 1897; char. emend.

Cellulæ parvæ, ovatæ vel ellipsoideo-ovatæ, in familias parvas subsphæricas libere natantes formantes; chromatophoris singulis parietalibus cum pyrenoidibus singulis; familiis cavernosis, e strato cellularum peripheric arum constitutis, sæpe subirregularibus, intra membranam vetustam reticulatam inclusis, membrana in lobos vel processus vel spinas irregulares producta; familiæ in coloniis parvis associatæ; coloniæ parvæ sæpe in coloniis magnis cum partibus membranæ vetustæ durissimæ conjunctæ.

89. Ineffigiata neglecta West & G. S. West in Journ. Roy. Micr. Soc. 1897, p. 503 (description imperfect). Character idem ac generis. Diam. fam. sing. 21–56 μ; diam. colon. 46–115 μ; long. cell. 5·7–10·5 μ; lat. cell. 3·4–5·3 μ. (Pl. 447, figs. 1–6.)

Hab. Generally distributed in stagnant waters throughout the British Islands, United States, India and Ceylon; also Italy, Tyrol.

The previous description of this alga, which appeared in 1897, was very incomplete. Since then we have obtained specimens from every part of the British Islands, and have examined the more detailed structure of the plant. Each family of cells is small, more or less spherical, and consists of a peripheral layer of cells surrounding a central cavity. The cells are ellipsoidal or ovate in form, and each one is furnished with a parietal green chromatophore containing a single small pyrenoid. The outer surface of each family of cells is covered by a tough elastic membrane of irregular form. This membrane consists partially of

cellulose, colouring a pale blue with chlor-zinc-iodine, and is folded and produced on its outer surface into all manner of irregular wrinkles, lobes, processes, and spines. Sometimes these irregular projections are wanting, but at other times the family can scarcely be seen for them. The membrane is undoubtedly a secretion of the underlying cells, and its presence renders the structure of the family exceedingly difficult of observation.

As a rule several of these small families occur agglutinated together, and a more indefinite-looking object it is impossible to imagine. Sometimes these small colonies are united by more or less rigid prolongations of the enveloping membranes into much larger colonies.

The families multiply by division into larger and larger colonies, ultimately becoming separated into smaller groups by the development of elongated processes of the surrounding membranes. Specimens have been observed in which the cells were slowly expelled from the families, each cell being sent into the surrounding water with a violent jerk. Possibly such cells are non-motile spores (cfr. fig. 4); but this is doubtful, and no other approximation to a reproductive process has been observed.

It is an exceedingly abundant alga in all kinds of situations—in ditches, bogs, tanks, water-butts, &c.—and it forms a regular and considerable constituent of the British freshwater plankton.

In older families, especially in the plankton, the cell-contents develop a brick-red oily material, such as is found in *Botryococcus Braunii* Kütz. In fact, the latter alga is by far the nearest relative of *I. neglecta*, although not so abundant. *Botryococcus Braunii* is not found in many situations in which *I. neglecta* occurs abundantly; its cells are larger and more globose, its colonies are more regular, and the families of cells are never enclosed in that tough membrane with its extraordinary irregularities which is such a striking feature of *I. neglecta*.

90. Palmellococcus miniatus (Kütz.) Chodat in Bull. Herb. Boissier, tom. ii. 1894, pp. 429, 599; Beiträge Kryptogamenfl. der Schweiz, Bd. 1, Heft 3, 1902, pp. 182, 158 cum fig. 80. *Pleurococcus miniatus* Näg. Diam. cell. 2–12·5 μ.

Hab. Bradford, W. Yorkshire, on damp tree-pots.

This minute alga frequently forms a moist green scum on the outer surfaces of plant-pots and other similar objects. It has in the past been referred to under the name of "*Protococcus viridis* Ag." This name is obsolete, having been given indiscriminately to many algæ of widely different characters.

The genus *Palmellococcus* of Chodat differs from *Pleurococcus* of Meneghini in the absence of pyrenoids from the parietal, plate-like chromatophores, and in the methods of reproduction. There are three methods of reproduction:—1st, by division of the original cell into two or four daughter-cells; 2nd, by a rejuvenescence of the cell-contents and an exuviation of the wall of the mother-cell; 3rd, by the formation of 8, 16, 32, or 64 spores within the wall of the mother-cell, which then ruptures and sets them free. At the moment of their liberation these spores are in a gelatinous vesicle.

MYXOPHYCEÆ.

91. DICHOTHRIX NORDSTEDTII Born. et Flah. *Hab.* Rocks above Llyn Ogwen, N. Wales.

92. HAPALOSIPHON INTRICATUS West. *Hab.* Moel Siabod; Llyn-y-cwm-ffynon; Glyder Fach, at 2200 ft., N. Wales.

93. H. HIBERNICUS West & G. S. West. *Hab.* Capel Curig, N. Wales; near Senens, Cornwall.

94. CHROOCOCCUS GIGANTEUS West. *Hab.* Moel Siabod, N. Wales.

DESCRIPTION OF PLATES 446–448.

PLATE 446.—Figs. 1–9. *Debarya desmidioides*, sp. n., × 520. 10. *Penium oblongum* De Bary var. *cylindricum*, var. n., × 520. 11. *Roya cambrica*, sp. n., × 520. 12. *Cosmarium quadrimamillatum*, sp. n., × 520. 13. *Staurastrum echinodermum*, sp. n., × 520. 14–17. *Conferva affinis* Kütz., × 520. 18–21. *C. obsoleta*, sp. n., × 520. 22–23. *Bumilleria pumila*, sp. n., × 520.

PLATE 447.—Figs. 1–6. *Ineffigiata neglecta* West and G. S. West, × 520; 1 and 2 are only outline drawings, 4 shows the escape of spore-like bodies, and 5 is part of a single family in section. 7–10. *Chlorobotrys regularis* (West) Bohlin, × 520. 11–13. *Uronema confervicolum* Lagerh., × 520.

PLATE 448.—Figs. 1–4. *Polychætophora lamellosa*, gen. et sp. n., × 520. 5. *Conochæte comosa* Klebahn, × 520.

NOTES ON MYRICACEÆ.

BY A. B. RENDLE, M.A., D.Sc.

THE last volume (xxxii.) of the *Mémoires de la Société Nationale des Sciences Naturelles, &c., de Cherbourg* is, except for a brief necrologic notice, entirely botanical. M. J. Cardot supplies an important paper, embodying the results of his anatomical researches on the Leucobryaceæ, and there is a short note on *Ribes triste* Pall. by M. E. de Janczewski. But the greater part of the volume is occupied by a monograph of the Myricaceæ by M. Auguste Chevalier. The first part comprises an account of the general characters of the family, including the general morphology and anatomy of the vegetative and floral organs. The second part is a systematic account of the genera and species, followed by notes on geographical distribution.

The last systematic account of the family is that by Casimir De Candolle in De Candolle's *Prodromus* (vol. xvi. pl. 2), which appeared in 1864. M. De Candolle's arrangement includes three genera: *Myrica*, *Leitneria*, and *Clarisia*; the two last have since been recognized as of other affinities, and the family, both in the *Genera Plantarum* of Bentham and Hooker, and in the *Pflanzenfamilien* of Engler and Prantl (where it was elaborated by Professor Engler), has been regarded as monotypic. M. Chevalier, however, regards as representing genera distinct from the remaining species the remarkable North American *M. asplenifolia* L. and the sweet gale, *M. Gale* L., with a few closely allied species. The

former was recognized as a distinct genus in the Banksian herbarium, where several sheets are written up by Solander *Comptonia asplenifolia* MS. Gaertner (Fruct. ii. p. 58, t. 60) published, in 1791, a full diagnosis "ex schedis Solandri," and prints the genus as *Comptonia* Banks. The citation in the Kew Index is "Banks ex Gaertner," and M. Chevalier also ascribes the genus to Banks. But Aiton in Hort. Kew. iii. 334 (1789), two years before, gives a brief diagnosis of the genus (to which M. Chevalier refers), quoting it as "*Comptonia* L'Hérit. Stirp. Nov. tom. 2, tab. 58." L'Héritier's plate was never published, and the genus must therefore be quoted as *Comptonia* Ait. There can be no doubt as to the identity of the plants of Gaertner and Aiton, as the only specimen quoted by the latter is one cultivated in 1714 by the Duchess of Beaufort, "Br. Mus. H. S. 141, fol. 37," and reference to the Sloane herbarium shows this to be the plant in question.

Myrica Gale and its few close allies appear under *Gale*, a pre-Linnean name quoted by Adanson (Fam. d. Plantes, ii. 345 [1763]) from Tournefort.

The family therefore contains three genera, the main distinction between which lies in the female flower and the fruit.

Gale.—Ovary smooth, subtended by two entire bracteoles, which form air-floats in the fruit; fruits in dense subcylindrical spikes.

Comptonia.—Ovary smooth, subtended by two laciniate bracteoles, provided with emergences at the base, and developing into a cupule. Fruit in spherical spikes.

Myrica.—Ovary covered with waxy or fleshy emergences, bracteoles absent or not accrescent. Fruit in a lax raceme.

Comptonia is distinguished by its stipulate leaves. M. Chevalier also points out the following anatomical distinctions.

Gale has scattered islands of sclerenchyma in the cortex of the mature stem, while the groups of secondary bast have no sclerenchymatous elements. *Comptonia* has a complete sclerenchymatous ring in the cortex of the stem; the groups of secondary bast include generally isolated sclerenchymatous fibres. *Myrica* has a complete sclerenchymatous ring in the stem cortex; the groups of secondary bast include islands of sclerenchyma.

Gale contains four species: *G. belgica* Dumort. Flor. Belg. 10 (1827), sweet gale; *G. portugalensis* Cheval. (*M. Gale* L. var. *portugalensis* C. DC.); *G. japonica* Cheval., a new species from Japan; and *G. Hartwegi* Cheval. (*M. Hartwegi* Watson), from the Western United States and Mexico.

Comptonia is monotypic—*C. asplenifolia* Ait.

Myrica contains fifty-one species, which are arranged in three sections:—

1. *Morella.*—Characterized by branched inflorescence, female spikelets bearing several ovaries, of which one only develops. Fruits large (6–8 mm.), covered when ripe with numerous small fleshy imbricated emergences. Species six, from South-east Asia and the Indo-Malayan Archipelago.

2. *Faya.*—With inflorescence simple or branched, spikelets

producing several ovaries, part only of which generally develop. Fruits moderate (4–6 mm. in diameter), often forming a syncarp. Emergences waxy or not, never fleshy. Species three, Atlantic Islands and North America.

3. *Cerophora*.—Inflorescence a simple catkin, spikelets generally isolated, simple and one-flowered. Fruits small (1–5 mm. in diameter). Emergences generally waxy, never fleshy. Falls into an African group of twenty-seven species and an American group of fourteen species.

In the course of arranging the material in the National Herbarium according to M. Chevalier's monograph, and the revision necessary, I have made a few notes which may be worth putting on record, especially as M. Chevalier was unable to visit the Museum and go through the collections. I have also gone over the genus in Linnæus' herbarium at the Linnean Society.

Linnæus in 1753 knew five species (Spec. Plant. 1024) as follows:—

1. M. Gale, specimens of which are found in his herbarium.

2. M. cerifera (Myrica foliis lanceolatis subserratis, caule arborescente), as authoritative for which he cites Gron. Virg. 120, which is based on Clayton's Virginia plant no. 692 (now in the National Herbarium). He also cites Myrtus brabanticæ similis caroliniensis baccifera, fructu racemoso sessili monopyreno Pluk. 250, t. 48, f. 9, Catesb. Car. i. p. 69, t. 69.

Linnæus makes a variety β (Myrtus brabanticæ similis caroliniensis humilior, foliis latioribus et magis serratis. Catesb. Car. i. p. 13, t. 13). The specimen is not contained in Catesby's herbarium (which forms part of Herb. Sloane).

Miller founded his *M. caroliniensis* (Dict. ed. 8, 1768, no. 3) on Catesby's figure, and Gronovius also referred to the same species Clayton's Virginia plant, no. 816 (Flor. Virg. p. 155, 1762) which we have in the National Herbarium. As the description states, and as Catesby's figure and Clayton's specimen confirm, the variety differs from the species in having broader, more serrated leaves. The specimens in Linnæus' herbarium, which he has written up *M. cerifera*, belong to the var. β. In recent American floras, *e.g.* Britton and Brown's *Illustrated Flora*, and Britton's *Manual of the Flora of the Northern States*, *M. caroliniensis* Mill. is recognized as a distinct species. M. Chevalier, however, while recognizing a second species synonymous with Catesby's citation, calls it *M. pensylvanica* Lois.-Desl. (in Nouv. Duhamel, ii. 1802, p. 190, t. 55). This is based on a cultivated plant, and while there may be no doubt as to its identity with the one figured by Catesby, there can be no sufficient reason for suppressing the earlier name of Miller. Moreover, *M. pensylvanica* appears first in Lamarck's Encyclopædia (ii. 592, 1786), where it is quoted as *M. pensylvanica* Hort. Reg.

3. M. asplenifolia is not found in Linnæus' herbarium, but his description and citations, including figures of Plukenet, the originals of which occur in Herb. Sloane, leave no doubt as to its identity with *Comptonia asplenifolia* Ait.

4. M. quercifolia.—There are two sheets written up by Lin-

næus which represent the species as generally understood from South Africa.

5. M. CORDIFOLIA.—Of this also there are two sheets written up by Linnæus, which represent the species as now understood and also correspond with Plukenet's figures and specimens.

The herbarium also contains a fruiting specimen, authenticated by Linnæus, of *M. æthiopica* L. Mant. 298 (1771), which Linnæus recognizes as a synonym of *M. conifera* Burm. f. Fl. Cap. Prodr. 31 (1768), and M. Chevalier has adopted the earlier name. Burmann's species is founded on Pluk. t. 48, fig. 8, and Linnæus also quotes Plukenet, together with a citation from Ray: "Arbor conifera odorata, foliis salicis rigidis leviter serratis, Ray, Hist. 1800," presumably taken from Plukenet (Almagesta, 260 [errore typico 250]), as Ray himself adds e Carolina. Plukenet has confused with the African species the American *M. cerifera*; he says, "ex America quoque nobis allata est, & a nostratibus Bermudensem insulam degentibus, Laurus odora vulgo nominatur." Ray's citation also doubtless refers to *M. cerifera*. The confusion has extended to the figures; tab. 48, fig. 8, in his Phytographia, which is referred to the African species, is obviously a male specimen of the same species as fig. 9, which represents a fruiting specimen of *M. cerifera*. The leaves are exactly alike in the two plants, and have the serrations in the upper part of the blade which characterize *M. cerifera*. So that Burmann's *M. conifera*, which is founded exclusively by a reference to Plukenet's figure, becomes a synonym of *M. cerifera*, and the African plant is *M. æthiopica* L. Mantissa, 298, excluding references to Burmann, Ray, and, in part, Plukenet; also of Linnæus' herbarium.

The Linnean herbarium also contains two sheets marked "*Myrica?*"; they are male specimens of *M. inodora* Bartram. Also a specimen mounted on a sheet differing in texture from the rest, and probably, Mr. Jackson suggests, inserted by the younger Linnæus. It bears the notes, in different hands, "An genus novum e Peru," in pencil, and "Escallonia 6," in ink, and is evidently *Myrica pubescens* Willd. There are also two sheets named, but not in Linnæus' hand, "*Myrica? trifoliata?*" one in flower, the other in fruit, and bearing the note "König 77." They represent the East Indian *Rhus mysurensis* Heyne, and cannot therefore have any connection with *Myrica trifoliata* L. Pl. Afr. var. and Amoen. Acad. vi. 112, which is an African plant (generally referred to *Toddalia lanceolata*), and differs also (e descript.) in the shape of the leaf and its dentate margin, and also in the scabrous fruit.

The following are a few notes on individual species:—

M. OCTANDRA Buchan. Hamilt. ex D. Don, Prodr. Fl. Nepal. 56 (1825).—M. Chevalier retains this species, which he knows only from the brief description in Don's Prodromus. We have Buchanan Hamilton's specimen in the National Herbarium; an examination shows it to be not a *Myrica* but *Aporosa Roxburghii* Baill. The specimen consists of one shoot, bearing leaves, and a single sessile male spike, which is about 1·5 cm. long. As far as I am able to determine, without destroying the spike, the flowers are not octandrous,

but generally tetrandrous. Buchanan collected the plant at Ettaura, April 2nd, 1802; his ticket bears the note, "Arbor urticis affinis? Myrica? octandra B." I find no reference to the plant in the *Flora of British India*.

M. KILIMANDSCHARICA Engl. Hochgebirgsfl. Trop. Afr. (1892), 188.—M. Chevalier places this species immediately after my *M. pilulifera* (Trans. Linn. Soc. ser. 2, iv. 43, 1894), "to which," he says, "it will probably be necessary to refer it when the species is better known." If the two are conspecific, Prof. Engler's name must stand, as it has two years' priority; the two plants are, however, strikingly different, and I do not think anyone seeing them side by side would suggest their identity. As M. Chevalier has apparently not seen *M. pilulifera*, and as we have also in the National Herbarium a good series of specimens of the plant on which *M. kilimandscharica* was founded (*M. salicifolia* var. ? Oliver in Trans. Linn. Soc. ser. 2, ii. 349, collected by H. H. Johnston on Kilimanjaro at 4–5000 ft.), I have thought it well to give a comparison of the two plants.

M. pilulifera (fruiting specimen).	*M. kilimandscharica*.
Leaves thin when dry, not coriaceous;	Leaves rather thick, subcoriaceous;
narrowly elliptical, narrowing towards the base and subacute apex, sometimes tapering more rapidly to the base;	broadly elliptical, blunt to rounded at base and apex;
margin serrate, but not deeply, in the upper two-thirds of the blade;	margin slightly wavy, not serrate;
network of veinlets well marked on both surfaces, especially on the lower, surfaces smooth, not conspicuously glandular, or lower surface sparsely glandular;	veinlets not apparent on upper or lower surface; both surfaces, especially the lower, glandular, excretion yellow;
larger leaves 5 to 6 cm. long by 1·5 to 2 cm. broad.	larger leaves on female plant barely 4 cm. long by barely 2 cm. broad, on male plant 6 to 7 cm. by 2·8 to 3 cm.

M. PILULIFERA var. PUBERULA var. nov. differs from the type in having upper leaf surface and margin more or less puberulous, and in the puberulous character of the stems and leaf-stalks. The serration of the leaf-margins is also more strongly marked.

Hab. Nyassaland; J. Buchanan, 1891. No. 939.

M. ÆTHIOPICA L. var. INTEGRA Cheval.—This variety is founded on a plant from Clanwilliam, recently collected by Schlechter (no. 8026), with "very entire finely reticulated lanceolate leaves." We have in the National Herbarium a similar specimen collected many years ago about 120 miles further south at "Berg river, Paarl," by Dr. R. C. Alexander (afterwards Prior).

M. CERIFERA L. var. PUMILA Mich.—There are in the National Herbarium, in herb. Banks, three specimens which should be included under this variety, but represent a very extreme form. Two of the specimens are labelled Dwarf Myrtle of North Carolina and came from John Bartram; one is described as "frutex bipedalis," the other as "3 or 4 feet high." The third is a fragment labelled "South Carolina, John Cree," and was put on the same sheet as the other two in herb. Banks. The slender branches and the leaves are densely glandular; the latter are oblanceolate in shape, with a tendency to a narrow cuneate base; the apex is shortly pointed, and they are markedly coriaceous. The length of the leaves is generally between 1 and 1·7 cm., very rarely exceeding the latter; in breadth they vary from 2 to a little over 4 mm. The bluntly oval male cones are 4 mm. long by little over 2 mm. broad; the bracts have a patch of glands on the middle of the dorsal surface.

Among the specimens of *M. cerifera* are several interesting old sheets, including, besides the Gronovian specimen and two from *Hortus Cliffortianus*, one in herb. Banks labelled Pensacola, Clifton. Mr. Britten gives me some information about Clifton, of whom very little seems to be known. Banks dedicated his genus *Cliftonia* to Clifton, and the following entry occurs in the Solander MS.:—"*Cliftonia* in honorem Dni. Guil. Clifton, armigeri, Justitiarii Floridæ occidentalis (Chief Justice of West Florida) qui hanc inter alia specimina ad Dnum. J. Ellis Armig. e Florida misit." Ellis was Agent for West Florida in 1764. The specimens on which the genus was founded, now in the National Herbarium, also come from Pensacola. Sargent (Silva N. Amer. ii. 5) wrongly attributes the dedication to Francis Clifton, M.D., an English physician, and friend of Hans Sloane; he died in Jamaica in 1736. According to the Linnean Correspondence (i. 418) Clifton was Attorney-General of Georgia in 1759. John Ellis also mentions him in a letter to Aiton, published in Phil. Trans. lx. (1770), 524, in connection with the discovery of *Illicium floridanum* by "a negro servant of William Clifton, Esq., chief justice of West Florida, in April, 1765, in a swamp near the town of Pensacola."

RUBI OF THE NEIGHBOURHOOD OF LONDON.

By the Rev. W. Moyle Rogers, F.L.S.

In the course of the last five years I have had considerable opportunities of studying the living Rubi on the outskirts of London, especially on the extensive commons and heaths to the south and south-west—in Surrey and Kent. Within the same period I have also seen considerable collections of dried brambles from the same neighbourhood. The facts which I have thus accumulated as to the present distribution of British brambles in localities within easy reach of the metropolis seem likely to be of interest to other students of the genus. The counties and vice-

counties touched are numbered as follows in *Topographical Botany*: 16, W. Kent; 17, Surrey; 18, S. Essex; 21, Middlesex.

The ground examined most closely lies within ten or twelve miles of Charing Cross, and a considerable majority of the localities given in this paper fall, I think, within such a radius. But in some directions I have thought it best to overstep this limit by a few additional miles, with a special view to the inclusion of such bramble-covered commons as are easily reached from London. My hearty thanks are due for their ready help to the friends and correspondents whose dried specimens from localities in which I have not seen the living bushes I have had the privilege of examining. As will be seen, my indebtedness in this way to Mr. J. Benbow, Mr. C. E. Britton, Mr. J. T. Powell, and Major A. H. Wolley Dod is especially great. In addition to the localities from which I have seen dried specimens, reference will be made in a very few instances to other localities reported to me for some of the same species by Mr. Britton. With these exceptions no localities are included in this paper beyond those in which I have seen the living bushes.

As most of the stations are commons or heaths, space will be economized by the use of the initials C. and H. to represent the words Common and Heath respectively. New "county records" (or vice-county records), or what are believed to be such, are distinguished by an asterisk.

These notes go far to show how favourably circumstanced London botanists are for the study of our British brambles. Thus it will be seen that even if they confine their attention to the four great suburban commons at Streatham, Tooting, Barnes, and Wimbledon, and the contiguous Putney Heath—all in Surrey, and quite near to London—they may examine the living bushes of no less than thirty-nine distinct bramble forms, many of which occur in considerable quantity in all five localities, while the majority of them are quite abundant locally.

Extending their researches so as to include Hampstead Heath (Middlesex) in the north-west, with Hayes and Chislehurst Commons and Plumstead and Shooter's Hill (West Kent) in the south, they will find the number of forms available for study increased to sixty-two. In other words, these ten localities, all within a radius of ten or twelve miles of Charing Cross, are now known to contain only one bramble form less than the total number hitherto found in all Scotland; while a few additional localities (some of them slightly further from London) in the four counties touched bring the total up to ninety-one, the number of forms for which (exclusive of hybrids) localities are given in this paper.

It remains for some resident botanist to examine the brambles of the parks and park-like places of Central London, a task which can hardly be fully accomplished without permission from the authorities to enter the locked enclosures.

Rubus idæus L. Without attempting to give localities for the type, I may state that the only station near London known to me for var. *obtusifolius* Willd. is copse below Uxbridge Common (21), *J. Benbow*.

Suberecti. Uncommon.

R. fissus Lindl. 16. Chislehurst C.; abundant near the ponds and quite typical. 18. Warley C., *Dr. Hind.* The apparent absence of this species from all the Surrey commons and heaths is remarkable.

R. Rogersii Linton. 16. Farnborough C., *E. F. Linton & D. T. Playfair.* Hayes C.; in considerable quantity over about a quarter of a mile of the common, not far from Hayes Railway Station.

R. plicatus Wh. & N. Singularly local. 16. West Chislehurst C., "plentiful," *Wolley Dod.* At end of Chislehurst C., near railway station, in one spot near the Memorial Cross. 17. Sheen C., *C. E. Britton.* Walton-on-Thames. This locality (where I had the advantage of Major Wolley Dod's guidance) may be understood generally to stand for Walton C., now a very broken though still extensive district. In succeeding notes it will appear as Walton. 21. Hampstead H., *Nicholson.*

Subrhamnifolii.

While this group is fairly represented by four out of its six species, they are all rare except *R. affinis.*

R. nitidus Wh. & N. subsp. *opacus* Focke. *17. Abrook C., abundant; Oxshott, Esher, and Fairmile Commons, sparingly, *Britton.* A form with pink petals, but otherwise most characteristic.

R. affinis Wh. & N. Fairly abundant locally. 16. Slopes east of Plumstead C., *Wolley Dod.* 17. Wimbledon, Barnes, and Tooting Commons, and Putney H.

R. integribasis P. J. Muell.? 17. Tooting C., a rather extensive thicket of it in one part; practically indistinguishable from the plant so common about Bournemouth (Hants and Dorset), for which Dr. Focke suggested this name as probably right.

R. holerythros Focke. 17. Abrook C., *Britton.*

Rhamnifolii.

Exceedingly common. On the heaths and commons to the south of London more abundant probably than all the other groups taken together.

R. imbricatus Hort. 17. Barnes, Wandsworth, and Wimbledon Commons. A strong form fairly frequent in these three not widely separated localities, and also several miles further to the south-west at Oxshott. This is the plant briefly referred to on p. 26 of my *Handbook of British Rubi*, and I have as yet seen it only in these four Surrey localities. Mr. Britton, however, to whom I showed the living bushes on Barnes C., tells me that he has since seen it also on Blackheath (W. Kent), as well as on two additional Surrey commons—Westend (Esher) and Whitemoor. It differs from the type conspicuously in its long slender patent *affinis*-like prickles, and in its longer-stalked subrotund and abruptly cuspidate leaflets, which are only very rarely imbricate. The panicles also are more compound than in the type, and when well developed have a broad truncate-corymbose top, which is far from characteristic of the species; while the petals seem to be invariably of

bright rose-pink instead of white or pinkish, as in the western plant. It may therefore be convenient to distinguish this form by the provisional name var. *londinensis*.

R. carpinifolius Wh. & N. Apparently the most abundant bramble in the immediate neighbourhood of London, though perhaps even there less generally distributed than *R. Lindleianus*. Certainly nowhere else in Great Britain do I remember to have seen this species so characteristic a feature of the bramble flora. 16. Bromley Hill Woods, *Linton & Playfair*. Hayes and Chislehurst C.; in great quantity on the latter. 17. Epsom, Abrook, and Sheen C.; Esher C. (a pink-flowered form), *Britton*. Exceedingly common at Streatham, Tooting, Barnes, Wimbledon, and Wandsworth Commons, and Putney H. Oxshott, Walton. 21. Near Uxbridge, *Benbow*. Hampstead H., in plenty; Hounslow H.

R. incurvatus Bab. Fairly frequent. 16. Hayes C. 17. Epsom C.; Whitemoor C., *Britton*. In good quantity on Barnes, Wandsworth, and Wimbledon C., and Putney H. *21. Hounslow H. In all these localities not the typical plant, but the constant well-marked form described in *Journ. Bot.* 1899, 194, as "going off from typical *R. incurvatus* towards *R. carpinifolius* and *R. rhombifolius*." Mr. C. E. Britton, my companion in my one visit to Hayes C. (August, 1902), pointed out to me there a plant which we were agreed in believing to be *R. incurvatus* × *rusticanus*.

R. Lindleianus Lees. Very generally distributed and locally abundant. 16. St. Paul's Cray, *H. Groves*. Keston, *B. J. Cooper*. Shooter's Hill, *Wolley Dod*. Chislehurst and Hayes C., rather local. 17. Littleworth and Epsom C.; Farley, near Warlingham; between Addington and Imes Hill, *Britton*. Clapham C.; Streatham and Tooting C.; and Putney H., abundant. Wimbledon and Wandsworth C., local. Lanes near Esher C. Walton. 18. Snaresbrook and Epping Forest, *Powell*. 21. Uxbridge C., *Benbow*. Hounslow H. Hampstead H., abundant. Southall.

R. Lindleianus × *rusticanus*. 16. Near Goathurst C., *Britton*.

R. erythrinus Genev. Usually somewhat glandular in panicle. Fairly frequent. 16. Keston C., *Britton*. Hayes and Chislehurst C. Halstead. 17. Fairmile C., *Britton*. Streatham, Tooting, and Wimbledon C., abundant. Wandsworth and Barnes C.

R. rhamnifolius Wh. & N. The usual British form. One of the more generally distributed species, though rather frequently occurring in only moderate quantity. 16. St. Paul's Cray C., *F. J. Hanbury*. Charlton and Plumstead, *Wolley Dod*. Keston C., *Linton & Playfair*. Chislehurst and Hayes C. 17. Sheen C., *J. E. Bagnall*. Abrook C., *Britton*. Streatham, Tooting, Wandsworth, Barnes, and Wimbledon C. Putney H. Esher. Oxshott. Walton. 18. Epping Forest, *Powell*. 21. Uxbridge C.; woods, Ruislip, *Benbow*. Harrow Weald C., *Trimen* (hb. Brit. Mus.). Hampstead H. Hounslow H.

Subsp. *Bakeri* F. A. Lees. 16. Hayes C., *de Crespigny*. Chislehurst C., local. 17. Locally abundant and very constant in character. Ham C., *Wolley Dod*. Fairmile and Westend (Esher) C., *Britton*. Tooting, Wandsworth, Barnes, and Wimbledon C., and Putney H. Oxshott.

R. pulcherrimus Neum. Usually abundant. 16. Plumstead; East Wickham; Bostal H., *Wolley Dod*. Farnborough C., *Linton & Playfair*. Hayes C. 17. Epsom; Cobham, *F. A. Rogers*. Sheen C., *Nicholson*. Between Littleworth and Abrook C., *Britton*. Clapham, Streatham, Tooting, Wandsworth, Barnes, and Wimbledon C. Putney H. Esher. Oxshott. Clapton C. 18. High Beech, Epping Forest, *Powell*. 21. Near Feltham, *Benbow*. Hampstead and Hounslow H.

Villicaules.

Not very strongly represented.

R. mercicus Bagnall var. *bracteatus* Bagnall. 21. Ruislip Woods, *Benbow*. (Apparently this.)

R. villicaulis Koehl. subsp. *Selmeri* Lindeb. Singularly local. 16. Dartford H., *Wolley Dod*. Keston C., *Linton & Playfair*. Chislehurst and Hayes C. 17. Walton. 18. Warley C., *Powell*. 21. Southall, in one spot; apparently this. Uxbridge C., *Benbow*.

Subsp. *calvatus* Blox. 17. Walton, *H. Groves*.

Subsp. *rhombifolius* Weihe. Local. 16. Eltham C., *Wolley Dod* (apparently this). Hayes C.; seen only in small quantity. 17. Barnes C., *Wolley Dod*. Abrook C., *Britton*. 18. Epping Forest, *Powell*. 21. Hampstead H.

R. gratus Focke. Rare. 16. Slade's Ravine, Plumstead C., *Wolley Dod*. 17. Putney H. Seen only in one large thicket; very luxuriant, but hardly typical.

Discolores. Abundant.

R. argentatus P. J. Muell. Widely distributed and locally very common. 16. Near Wickham, *de Crespigny*. Chislehurst C., frequent. Hayes C. Halstead to Knockholt. 17. Most abundant, and usually a very strong and prickly form, which was wrongly reported by me in *Journ. Bot.* 1897, p. 410, as "*R. pubescens* Weihe (sp. coll.)." Littleworth and Epsom C.; by Frith Wood near Addington, *Britton*. Streatham, Tooting, Wandsworth, Barnes, Wimbledon, and Esher C. Putney H.

R. argentatus × *rusticanus*. 16. Shooter's Hill to Eltham. 17. Between Barwell Court Wood and Oxshott H.; Cooper's Hill, Claygate, *Britton*.

Var. *robustus* P. J. Muell. 16. Path to Wickham Wood, *Wolley Dod*. 17. Mitcham C., *Britton*.

Var. *clivicola* A. Ley. 16. Chislehurst C., at the end near the railway station, in good quantity. Halstead. In both localities, I think, inseparable from the west-country plant, though perhaps not exactly identical with it.

R. rusticanus Merc. Very widely distributed and locally abundant, but far from common on much of the heathland. 16. Plumstead Marshes, *Wolley Dod*. Hayes and Chislehurst C., &c. 17. Epsom, *F. A. Rogers*. Tooting, Streatham, Wimbledon, and Barnes C., &c. 18. Epping Forest, *Powell*. 21. Horsenton, *Benbow*. Hampstead H., &c. Especially common at Southall and Brentford.

R. pubescens Weihe var. *subinermis* Rogers. Somewhat local. 16. Shooter's Hill, *Wolley Dod*. Keston, *Groves*. Darenth Wood,

de Crespigny. 17. Claygate (labelled "*R. macrophyllus*"), *H. C. Watson*. Long Ditton, *Groves*. Abrook and Claygate C., and about Esher, *Britton*. Streatham and Tooting C. Putney H. to Wimbledon C. Oxshott. 21. Hampstead H.

[*R. laciniatus* Willd. 17. Westend C., Esher, *Britton*. On this Mr. Britton writes: "On the common with other brambles; one large clump with seedling plants growing around." I meet with this plant rather frequently in many parts of England, but as a rule either in gardens or in waste spots near them. So I have not been in the habit of noting localities.]

Silvatici.

R. silvaticus Wh. & N. Apparently rare. 17. Sheen C., *W. P. Hiern*. 21. Harrow Weald C.; near Enfield, *Benbow*.

R. lentiginosus Lees. 16. Hayes C., in good quantity locally. Pickhurst Green, near Hayes; "abundant here and almost the exclusive bramble," *Britton*. In both localities a remarkably strong form or state.

R. macrophyllus Wh. & N. Local. 16. Westwood Lane, *Wolley Dod*. Wood near Swanley, *Hanbury*. 17. Wood at Lonesome, near Mitcham (type); Abrook C.; lane from Oxshott H. to Fairmile C., *Britton*. Putney H. Near Roehampton. Wimbledon C. 18. Warley, on common and near barracks, *Powell*. 21. Highgate Wood; Bishop's Wood, *Benbow*. Hampstead H., growing with *R. pubescens* var. *subinermis*, but keeping quite distinct.

Subsp. *Schlechtendalii* Weihe. Apparently rarer than is usual in the south of England. 17. Putney H.; a somewhat glandular form. 21. Ruislip Wood; lane between Harmondsworth and Stanwell, *Benbow*.

R. Questierii Lefv. & Muell. 16. Halstead, abundant; a very glandular form, seen only here.

R. Colemanni Blox. 17. Fairly abundant on Barnes and Wimbledon C. Walton.

Vestiti.

With the exception of *R. leucostachys* decidedly local.

R. Sprengelii Weihe. Only moderately frequent. 16. Shooter's Hill, *Wolley Dod*. Keston, *B. J. Cooper*. Hayes and Keston C., *Groves*. Barnet Wood, *Linton & Playfair*. 17. Abrook C., *Britton*; a form with very shallow leaf-toothing and subglabrous or glabrescent stem and carpels. 18. Epping Forest, *Powell*. 21. Harrow Weald C.; Stanmore H., *Benbow*. Hampstead H.

R. micans Gren. & Godr. Apparently very rare. 16. Keston C., *Linton & Playfair*. Between Halstead and Shoreham (untypical).

R. pyramidalis Kalt. Uncommon. 16. East Wickham, *Wolley Dod*. 17. Oxshott. 18. Epping Forest—High Beech and beyond Robin's Hood, *Powell*. 21. Hampstead Hill.

R. leucostachys Schleich. Very frequent. 16. Plumstead C., &c., *Wolley Dod*. Hayes and Chislehurst C. Halstead. 17. White Downs; Fairmile C.; between Selsdon and Farley; border of Frith Wood near Addington, *Britton*. Streatham, Tooting, Barnes, and Wimbledon C. Putney H. 18. Epping Forest, *Wolley Dod*.

21. Harrow Weald C.; near Uxbridge, *Benbow*. Hampstead H. (two forms). Southall.

R. leucanthemus P. J. Muell.? 17. Rather widely though thinly distributed. Epsom C., *Britton*. Wimbledon C., local. Oxshott, in two or three places near the railway station. Identical with the Devon, Dorset, and Hants plants, for which I have suggested this name.

R. lasiocladus Focke var. *angustifolius* Rogers. 17. Wandsworth C. Putney H. and Wimbledon C., in some quantity.

Egregii.

Fairly well represented in Kent and Surrey, but apparently rare in South Essex and Middlesex.

R. cinerosus Rogers. Fairly frequent. 16. Shooter's Hill; West Wood Lane, *Wolley Dod*. Honor Oak Park, *A. Ley*. 17. Streatham C., in fair quantity. Wimbledon C. Oxshott.

R. mucronatus Blox. Uncommon. 16. Between Eltham and Queen's Wood, *Wolley Dod;* a very glandular and hairy form. 17. Kew, *Nicholson*. Tooting C.; a form. 21. Bayhurst Wood, Ruislip, *Benbow*.

R. Gelertii Frider. Apparently rare. 16. Farnborough C., *Linton & Playfair*. 17. Whitemoor C.; Fairmile C.; lane between Ranmore C. and Oaken Grove, *Britton*. Not typical, any of it, but I think all best placed here.

R. anglosaxonicus Gelert. Rare. 16. Crown Wood, Shooter's Hill, *Wolley Dod*. 17. Wimbledon, *Groves*.

Subsp. *raduloides* Rogers. 16. Dartford H., *Wolley Dod*.

R. melanoxylon Muell. & Wirtg. Apparently very rare. 16. Crown Wood, Shooter's Hill; Bexley Wood (apparently this), *Wolley Dod*.

R. infestus Weihe. Rare. 16. Farnborough C., *Linton & Playfair*. Hayes C. 18. Near Loughton, *Powell*.

R. Drejeri G. Jensen. Only known from 16. Slade's Ravine, Plumstead C., *Wolley Dod*.

Radulæ.

Very fairly represented.

R. radula Weihe. Local. 16. Shooter's Hill, *Wolley Dod*. 17. Mitcham, *Groves*. Barnes C. (in one spot, 1902). Tooting C. Esher. 21. Perivale, *de Crespigny*. Long Lane, Ickenham; Cowley; Scratch Wood, near Edgware, *Benbow*.

Subsp. *anglicanus* Rogers. 16. Chislehurst C.; a weak form. 17. Fairly abundant in a few places. Wood at Lonesome, near Mitcham, *Britton*. Barnes C. Putney H. 21. Hampstead and Hounslow H.

Subsp. *echinatoides* Rogers. Fairly frequent. 16. Oxlea's Wood, Shooter's Hill, *Wolley Dod*. Hayes C. 17. Littleworth C.; Barnes C.; barren slopes by Featherbed Lane, Addington, *Britton*. Streatham C., in some quantity. Tooting C. 21. Paddington Canal towards Sudbury, *de Crespigny*.

R. echinatus Lindl. Still more frequent no doubt than appears from the following list of localities:—16. Bostal H.; West Wood

Lane; Eltham, *Wolley Dod*. 17. Epsom and neighbourhood, *F. A. Rogers*. Near Lochner Holt; near Warren, Albury, *S. T. Dunn*. Shackleford, *Groves*. Barren slopes by Featherbed Lane, Addington, *Britton*. Wandsworth C. Wimbledon C. to Putney H. Walton. 18. High Beech, Epping Forest, *Powell*. Puntleat, *Wolley Dod*. 21. Hatton; Ruislip Woods, &c., *Benbow*.

R. rudis Wh. & N. 16. Near Chelsfield, *Groves*. Keston C., *Britton*. 17. Near Warlingham and Woldringham, *Groves*. Walton.

R. oiglocladus Muell. & Lefv. var. *Bloxamianus* Colem. Seen only from one locality. Woods by Uxbridge C. (21), *Benbow*.

R. podophyllus P. J. Muell. Seen only from 16. Slade's Ravine, Plumstead C., *Wolley Dod*.

Sub-Koehleriani.

Very rare, except *R. Babingtonii* and its variety.

R. Babingtonii Bell Salt. Frequent. Locally very abundant. 16. Wood at Bromley, *de Crespigny*. Bostal H.; Shooter's Hill; East Wickham; Hanging Woods, Charlton, *Wolley Dod*. Farnborough C., *Linton & Playfair*. Abundant at Chislehurst C. Hayes C. 17. Oxshott, *F. A. Rogers*. Wandsworth C. Putney H. to Wimbledon C. Walton. 21. Copse below Uxbridge C.; Park Wood, *Benbow*.

Var. *phyllothyrsus* (Frider.). Locally abundant in 17. Oxshott, *F. A. Rogers*. Wimbledon, Esher, and Abrook C.; lane between Barwell Court Wood and Stokesheath Farm (between Claygate and Oxshott), *Britton*. In all these localities a remarkably luxuriant form of this variety with very diffuse panicle, deep pink petals, and rather coarsely toothed leaves. Mr. Britton tells me that it grows on all the commons and heaths between Thames Ditton and Cobham.

R. Lejeunei Wh. & N. subsp. *ericetorum* (Lefv.). 16. Roadside between Avery Hill and Queen's Wood, near Eltham, *Wolley Dod*. I know no other locality for this at present, but it will almost certainly be found elsewhere near London, as it is common in many parts of Surrey and Sussex.

Sub-Bellardiani.

Unusually well represented.

R. fuscus Wh. & N. Certainly uncommon. 16. Bostal H.; Shooter's Hill; Plumstead; wood near East Wickham, *Wolley Dod*. Fawke C. (var.), *Britton*. Chislehurst C. 17. Esher; a weak form. 18. Epping Forest; Snaresbrook, *Powell*.

Var. *nutans* Rogers. Local. 16. Bostal H.; Shooter's Hill, *Wolley Dod*. 17. Oxshott, in considerable quantity.

Var. *macrostachys* P. J. Muell. Very rare. 18. Epping Forest, *Powell*.

R. pallidus Wh. & N. Apparently rare. 16. Path opposite the 'Bull Inn,' Shooter's Hill; heath near East Wickham, *Wolley Dod*. 21. Baylhurst Wood, Ruislip, *Benbow*.

Var. *leptopetalus* Rogers. Locally abundant. 16. St. Paul's Cray, *Groves*. Crown Wood, Shooter's Hill, *Wolley Dod*. Farn-

borough C.; Bromley, *Linton & Playfair*. Chislehurst C., exceedingly abundant. 18. Epping Forest, *Groves*. Buckhurst H., *Powell*.

R. scaber Wh. & N. Local. 16. Wood near Swanley, *Hanbury*. Thorndean Wood, *Marshall*; in great plenty, a form. Hayes C., *Linton & Playfair*. 21. Horsenton; Perivale Wood; Top Wood; Hadley Wood, *Benbow*.

R. longithyrsiger Bab. Rare. 16. Crown Wood, Shooter's Hill; "in profusion over several acres"; roadside between Avery H. and Queen's Wood, near Eltham, *Wolley Dod*. The only East England localities known for this well-marked species, which is so abundant in the west from Cornwall to Carnarvon, but has not yet been found in Ireland, Scotland, or on the Continent.

R. foliosus Wh. & N. Locally common. 16. Keston and Hayes C.; Darenth Wood; wood on Gad's Hill, *de Crespigny*. East Wickham; Shooter's Hill; Eltham; West Wood Lane, *Wolley Dod*. Halstead. 17. Barren slopes by Featherbed Lane, Addington, *Britton*. Putney H. 18. Epping Forest, *Powell*. 21. Park Wood, near Uxbridge; Highgate Wood, "abundant," *Benbow*. Harrow Weald C., *Linton*.

R. foliosus × *leucostachys*. 16. Halstead.

Koehleriani.

Fairly though somewhat thinly distributed.

R. rosaceus Wh. & N. (type or forms near it). 17. Epsom C.; edge of Frith Wood, Farley, near Addington, *Britton*. 18. Near Walthamstow, *Powell*. 21. Hampstead H. Not quite the typical plant in any of these localities.

Var. *hystrix* (Wh. & N.). Uncommon. 17. Wimbledon C. Wandsworth C. (var. or form near it). 18. Warley C., *Powell*. 21. Hampstead H., *de Crespigny*.

Subsp. *infecundus* Rogers. Apparently much the most frequent rosacean form. 16. Shooter's Hill, *Wolley Dod*. Wood near Bromley; Chislehurst C., *de Crespigny*. Keston C., *Groves*. Hayes C. Halstead. 17. Lane between Barwell Court Wood and Oxshott H.; Frith Wood, Farley, *Britton*. Oxshott. 18. High Beech, Epping Forest, *Powell*. Norton H., *Wolley Dod*. 21. Harrow Weald C., *de Crespigny*. Highgate Wood; Winchmore Hill Wood; Pinner; Ruislip; Uxbridge; Enfield Chase; Bishop's Wood, *Benbow*. Hampstead H.

Subsp. *adornatus* P. J. Muell. Locally abundant. 16. Keston C., *Groves*. Hayes C. 17. Streatham C. Wimbledon C., in plenty. Tooting C., near cricket-ground and ponds, in great quantity. 21. Between Hendon and Mill Hill; Duck's Hill, Ruislip, *Benbow*.

Subsp. *Powellii* Rogers. Local. 16. By a path up Shooter's Hill from Plumstead; also near Crown Woods, *Wolley Dod*. 18. Epping Forest; "abundant and remarkably constant over the more elevated parts," *Powell*.

R. fusco-ater Weihe. Known only in one locality. 17. Barren slopes between Addington and Chelsham, *Britton*.

R. Koehleri Wh. & N. The typical plant seems very rare. 21. Park Wood, Uxbridge; Whitton Park, *Benbow*.

Var. *cognatus* (N. E. Brown). Apparently very rare near London, though locally abundant in the Witley neighbourhaod, West Surrey. 21. Duck's Hill, Ruislip, *Benbow*.

Subsp. *dasyphyllus* Rogers. Rather local, as is usual in the south of England. 16. Halstead. 17. Putney H. near the reservoir, in plenty. Wandsworth C., local. Barnes C., by the road. 21. Park Wood, Uxbridge, *Benbow*. Highgate Wood, *de Crespigny*. Southall. Hampstead H.

R. Marshalli Focke & Rogers. Local. 16. Bostal H., two or three bushes, *Wolley Dod*. 17. Blackheath, *Dunn*. Wimbledon C., very local and not quite typical. 21. Park Wood (Swakeley's End), Uxbridge, *Benbow*. On Putney H. occurs what I believe to be a form of my var. *semiglaber*.

Bellardiani.

As was to be expected in so lowland and for the most part open district, this group is by no means strongly represented.

R. viridis Kalt. Widely but thinly distributed. 16. Wood near East Wickham, *Wolley Dod* (apparently this species). 17. Chelsham, *Mennell*. 18. Epping Forest (Lippitt's Hill; High Beech), *Powell*. 21. Hampstead H.; Highgate Wood; Bishop's Wood; near Pinner; Scratch Wood; Ruislip Wood, *Benbow*.

R. Bellardii Wh. & N. Apparently very rare. 17. Frith Wood, Farley, *Britton*.

R. serpens Weihe. Rare. 16. Road to Crown Woods, Shooter's Hill, *Wolley Dod*. Thought by Dr. Focke to be var. *rivularis* Muell. & Wirtg. Halstead and near Shoreham; a very slender woodland form in both places.

R. hirtus Wald. & Kit., *sp. collect*. 16. Trinley Wood, near Fordwich, *Hanbury*.

Subsp. *Kaltenbachii* (Metsch.). 16. Crown Woods, Shooter's Hill, in plenty; woods near Northumberland H.; Gad's Hill, *Wolley Dod*.

Cæsii.

Not conspicuously abundant in the district as a whole.

R. dumetorum Wh. & N. Usually rather scarce on the heaths and commons, but locally abundant in lanes and wood-borders. The following localities are those known for the forms described in my *Handbook of British Rubi*. Usually, however, most of the bushes met with are more or less intermediate, and these are omitted here.

a. *ferox* Weihe. The following list of localities is probably far from exhaustive:—16. Chattenden Wood, *Wolley Dod*. Hayes C., mostly rather weak. 17. Wimbledon C. 18. Warley C., *Powell*.

b. *britannicus* Rogers. 16. Keston C.; near Orpington, *Groves*. 17. Wandsworth C. (apparently this).

c. *diversifolius* (Lindl.). 18. Epping Forest, *Powell*. 21. Harrow Weald C., *W. R. Linton*.

d. *tuberculatus* Bab. 16. Halstead.

e. *concinnus* Warren. 17. Streatham and Tooting C.; form with exceptionally glandular and hairy stem.

R. corylifolius Sm. Typical *sublustris* (Lees) and forms near it frequent. 16. Clapham and Hayes C. Halstead. 17. Mitcham C. and neighbourhood; Epsom C.; near Addington, *Britton*. Streatham, Tooting, Barnes, and Wimbledon C. Putney H. Esher. Oxshott. Walton. 21. Hampstead H. Brentford. Southall.

Var. *cyclophyllus* (Lindeb.). Certainly not infrequent, but I have no notes of exact localities, except the following two:—17. Wandsworth C. 18. Epping Forest, *Powell*.

R. Balfourianus Blox. Widely but rather thinly distributed. 16. Shooter's Hill, *Wolley Dod*. 17. Littleworth C.; Frith Wood, Farley, *Britton*. Absent or nearly so from most of the commons, but fairly frequent in lanes near them at Esher, Oxshott, and Walton. 21. Hatton and Harlington; Perivale, *Benbow*.

R. cæsius L. Fairly frequent, though absent from considerable districts. 16. Green Street Green, *Wolley Dod*. Halstead. 17. Near Teddington Lock, *Britton*. Esher. Walton. 18. Buckhurst Hill, *Powell*. 21. Stanmore H., *Benbow*. Brentford. Southall.

LEPIDIUM SMITHII Hook. var. *ALATOSTYLA*.

By Frederick Townsend, M.A., F.L.S.

Towards the latter end of September, 1900, I sowed, in a garden pot, some seed of *Lepidium Smithii* var. *alatostyla* from the Redbridge Station;* it germinated, but did not flower, in 1901; single plants were repotted in the autumn of same year, and it flowered twice in 1902. The first flowering took place while the plants were in pot, and the rhizome, or axis, being determinate† they sent up a central stem, but they became affected with blight, and I transplanted them in the open. In midsummer they produced abundant prostrate shoots, all of which flowered and bore *indehiscent* silicles, as described in my paper referred to above. Thus the indehiscent character has been maintained in the cultivated plant. To describe the silicle more accurately—it is not notched; the outer edges of the wing where they meet the style are directed upwards, and describe with it two obtuse angles, one on either side of the style. In *L. Smithii* the silicle is notched, the outer edges of the wing turn downwards before they meet the style, and form with it an acute inner angle. The same description may be applied to the silicles of *L. heterophyllum* Benth. Where the wing is simply rounded and without a notch the angles formed by the outer edges with the style are right angles, but acute angles when the edges turn downwards to form a notch.

I know of no other instance in which *L. heterophyllum* Benth. or *L. Smithii* Hook. exhibits the same form of silicle. The silicles of

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* See Journ. Bot. 1900, p. 420.

† *L. hirtum* DC. is described by French botanists as having the "rhizome indéterminé."

the specimen of the former from Vallée d'Egnes 25–26, 6, 5, in the Kew Herb., which I alluded to in my former paper as apparently having similar silicles, are so immature, that later experience teaches me no inference can be drawn from them. I find that though at this stage of development they may be entire, they become notched or simply rounded when mature. Mr. E. F. Linton has distributed specimens from Kinson, Dorset, which he has named *L. Smithii* Hook. var. *alatostyla* Towns. Aug. 18, 1890, but a close examination of the silicles of these will show that they exhibit the character of *L. heterophyllum* Benth. and not that of the Redbridge plant, the silicles being slightly notched or simply rounded at the summit. There are in Mr. Joseph Wood's Herb. two specimens named *Thlaspi hirtum* from Lymington, with the date June 14, 1848, one of which is very similar to the Kinson plant, the silicles being faintly notched, while in the other they are much more deeply notched.

Further observation of the cultivated plant of the var. *alatostyla* during this autumn and winter have shown how the seed escapes from the indehiscent silicle. This is effected by the decay of the cellular tissue on the under side of the silicle immediately under the two seeds in each valve. The longitudinal fibrous tissue does not decay so rapidly, but the decay of the cellular tissue leaves longitudinal slits through which the seeds escape. The late J. T. Boswell, in the Report of the Botanical Exchange Club for 1882, makes the following note on the var. *alatostyla*: "A very remarkable plant, probably deserving to be considered a subspecies if it comes true from seed. The entire pods are considerably more swollen below than in *L. Smithii*, the fruit peduncles are shorter, and the rachis has longer hairs."

That this variety presents a very marked departure from *L. heterophyllum* Benth. and *L. Smithii* Hook. cannot be denied, and if the differences are considered such as to constitute the plant a subspecies, I would suggest the adoption of the name *Lepidium alatistylum* suggested by Mr. Boswell.

ALABASTRA DIVERSA.—Part X.

By Spencer Le M. Moore, B.Sc., F.L.S.

(Continued from Vol. xl., p. 409.)

New Plants from Australia.—II.

Last summer the British Museum acquired by purchase a set of the plants collected in the Coolgardie district of Western Australia by Mr. Leonard C. Webster. I have worked out the Gamopetalæ of this collection, which, besides examples of several very rare species, embraces the five novelties described below.

Ixiolæna Websteri, sp. nov. Perennis caulibus e rhizomate valido plurimis ascendentibus copiose foliosis sparsim ramosis

undulatis piloso-araneosis, foliis sessilibus lineari-lanceolatis vel oblanceolato-linearibus apice mucronulatis subtus eminenter uninervosis lana araneosa glandulis minimis lucentibus conspersa obtectis, pedunculis folia longe excedentibus gracilibus distanter parvibracteatis puberulis, capitulis parvis multifloscul osis heterogamis flosculis paucis exterioribus femineis reliquis hermaphroditis, involucri glanduloso-puberuli hemisphærici circa 5-serialis phyllis anguste linearibus demum recurvis extimis quam reliqua manifeste brevioribus intimis appendice brevi scariosa haud vel vix radiante onustis, flosculis involucrum breviter excedentibus, styli ramis truncato-capitulatis, achæniis cylindricis angularibus glabris, pappi setis circa 10 albis barbellato-scabridis achænia multo excedentibus.

Caules circiter 10·0 cm. alt., subquadrangulares, decolores. Folia 1·5–2·5 cm. long., deorsum 0·25–0·3 cm., sursum 0·3–0·5 cm. lat., membranacea. Pedunculi 6·0–8·0 cm. long., 0·05 cm. diam., in sicco pallide straminei; horum bracteæ modice 0·4–0·7 cm. long., araneoso-pilosæ. Capitula pansa 0·6 cm. long., vix 1·0 cm. diam. Involucri phylla extima 0·25 cm. interiora 0·5 cm. long., omnia circa 0·03 cm. lat., dorso carinulata, herbacea. Flosculorum fem. corollæ attenuatæ, una cum interioribus luteæ, ægre 0·5 cm. long. Androecium subexsertum. Antherarum loculi longissime tenuissimeque caudati. Achænia adhuc cruda 0·13 cm., pappi setæ fere 0·5 cm. long.

Distinguished from *I. tomentosa* Sond. & F. Muell. by reason of its longer and broader leaves, small hemispherical heads, long slender peduncles, narrower puberulous involucral leaves, heterogamous capitula, much smaller florets, and shorter achenes and pappus.

Dampiera (§ Cephalantha) **plumosa**, sp. nov. Herba perennis rhizomate crasso cæspitoso dense lanoso, foliis radicalibus anguste oblanceolatis obtusis obtusissimisve deorsum in petiolum latum villosum desinentibus pag. sup. glabris in sicco olivaceis pag. inf. arcte albo-stellato-tomentosis, scapis ascendentibus folia bene superantibus sursum ramosis rari- et parvibracteatis glabris, floribus parvis atro-cæruleis in spicis terminalibus breviter cernuis bracteas parvas anguste lineari-lanceolatas acutas glabras gerentibus dispositis, pedicellis brevissimis pilosis, calycis albo-villosi lobis setaceis corollam fere semiæquantibus, corollis basi integris extus breviter villosis, ovario 1-loculo 1-ovulato.

Folia in toto 3·0–4·0 cm. long., summum 0·6–1·0 (rarissime 1·3) cm. lat. Scapus angulatus, adusque 10·0 cm. long., hujus ramuli patuli, bracteæque lineari-lanceolatæ, 0·5 cm. long. Spicæ circa 0·8 cm. long., harum bracteæ circa 0·4 cm. long. Calycis lobi 0·3 cm. long., supra et intus fusci. Corolla in toto 0·7 cm. long., pars integra 0·15 cm. Fructus ——.

A very distinct species, differing from *D. eriocephala* De Vr. in many details of leaf and flower.

Solanum Oldfieldii F. Muell. var. plicatile var. nov. foliis parvis oblongis marginibus eximie plicatis modo 1·3–1·5 cm. long., calyce quam is typi paullulum minore haud æruginoso. *S. chenopodinum* S. Moore in Journ. Linn. Soc. xxxiv. p. 206, non F. Muell.

The Elder Expedition people collected both type and variety at Camp 50 in the Victoria Desert. These specimens I have seen in the Kew Herbarium.

Eremophila (§ Platychilus) **Websteri,** sp. nov. Ramulis foliosis angulatis pilis perbrevibus glandulosis copiosissime obsitis demum glabris, foliis parvis subsessilibus lineari-lanceolatis integris obtuse acutis deorsum parum angustatis coriaceis resinosis, floribus solitariis majusculis, pedunculis sæpissime folia subæquantibus resinosis post floritionem nutantibus, calycis ampli resinosi lobis 3 exterioribus ovato-oblongis interiores 2 oblongo-lanceolatos basi omnino obtegentibus lobis omnibus obtusis vel obtuse-acutis, corollæ extus puberulæ tubo supra ovarium constricto inde dilatato faucibus amplis dense lanosis labii antici lobis inter se subæqualibus (lobo intermedio paullo latiore) ovato-oblongis obtusissimis labio postico rotundato breviter bifido, staminibus inclusis, ovario hirsuto, stylo deorsum piluloso, ovulis quove in loculo 3 quorum 2 abortiva.

Folia modice 1·5–2·5 cm. long., et 0·4–0·7 cm. lat., in sicco olivacea; petioli modo 0·1 cm. long. Calycis alte partiti lobis 1·2 cm. long., exteriores 0·6 interiores 0.45 cm. lat. Corolla verisimiliter punicea, in toto paullo ultra 2·0 cm. long.; tubus 1·5 cm. long., basi 0·4 cm. faucibus circa 1·0 cm. diam.; labii antici lobus intermedius 0·9 cm. long., 0·8 cm. lat., lobi laterales 0·65 cm. lat.; labium posticum 0·8 cm. long., 1·3 cm. lat. Filamenta ad 0.5 cm. supra basin tubo inserta, breviora 1·0 cm. long., longiora circa 1·2 cm. Ovarium 0·4 cm. et stylus 1·7 cm. long.

Apparently nearest *E. Willsii* F. Muell., differing from it in the narrower entire leaves, longer peduncles, broader lower lip of corolla, long style, &c.

Lachnostachys coolgardiensis, sp. nov. Erecta, dense, pallide fulvido-tomentosa, caule copiose ramoso ramis angulatis sat validis crebro foliosis, foliis longe decurrentibus lineari-oblongis obtusissimis marginibus arcte revolutis necnon aliquantulum rugulosis costa media subtus maxime eminente, spicis densifloris simplicibus axillaribus terminalibusve folia subæquantibus, calyce parvo adusque $\frac{1}{3}$ 5–6-lobo lobis deltoideo-oblongis obtusis, corolla quam calyx paullo breviore extus glabra intus hirsuta limbo omnino truncato, staminibus 5–6 filamentis marginalibus, ovario pubescente, stylo exserto glabro.

Ramuli circa 0·5 cm. diam. Folia 1·5–2·5 cm. long., 0·5 cm. lat. Spicæ 1·0–1·5 cm. long., 0·6 cm. diam. Calyx (lana haud exempta) vix 0·3 cm. long., 0·2 cm. diam. Corolla 0·2 cm. long. Filamentorum pars libera 0·2 cm. long.; antheræ ovoideæ 0·04 cm. long. Ovarium vix 0·1 cm. et stylus 0·35 cm. long.

Distinguished by the short strongly decurrent leaves, the short dense spikes, small calyces, &c.

Cyanostegia microphylla, sp. nov. Suffrutex valde resinosus, crebro ramosus, foliis parvis sessilibus lineari-oblongis obtusis margine dentatis multiglandulosis coriaceis, paniculis folia longe superantibus, pedunculis oppositis ascendentibus bracteis

parvis onustis, pedicellis flores evolutos excedentibus, calycis parvi extus glanduloso-puberuli saturate cærulei lobis brevibus suborbicularibus posticis circum fructum quam antici insigniter brevioribus, corollæ labio postico 2-lobo antici lobo intermedio lingulato lobos laterales ovato-rotundatos excedente, filamenta breviter exserta, antheris lineari-oblongis, capsula brevi subsphæroidea sursum verrucis elevatis in pilum sat elongatum semel dichotomum abeuntibus onusta.

Folia 0·5–0‘8 cm. long., 0·15–0.25 cm. lat.; glandulæ immersæ utrinsecus creberrimæ. Paniculæ adusque 10·0 cm. long.; harum bracteæ 0·15–0·35 cm. long. Pedicelli ± 0·5 cm. long. Calyx florescens 0·4 cm. long., 0·6 cm. diam.; lobi 0·25 cm. long. et 0·3–0‘35 cm. lat., obtusissimi; calyx frutescens 1·0 cm. diam.; lobi antici 0·35 cm. long., 0·5 cm. lat.; postici 0·2 cm. long., 0·4 cm. lat. Corollæ extus puberulæ tubus 0·15 cm. long.; labii postici lobi circa 0·16 cm. long. et 0·2 cm. lat.; antici lobus intermedius 0·33 cm. long. Filamenta 0·3 cm. long., sursum incrassata; antheræ modo 0·07 cm. lat. Stylus curvatus, glaber, 0·45 cm. long, Capsula monosperma, circa 0·25 cm. diam., hujus verrucæ circa 0·1 cm. alt.

The chief peculiarities of this are the very small toothed leaves, the small deep-blue flowering calyx, the narrow anthers, and warted fruit. The fruiting calyx is also a trifle smaller than is that of *C. angustifolia* Turcz., and, so far as concerns the specimens examined by me, there is greater difference in the size of its anticous and posticous lobes.

A plant in the Kew Herbarium, collected by the Elder Expedition and communicated under the name *C. Turczaninowii* F. Muell., agrees exactly with this.

The fruit has been described from a specimen which Dr. Pritzel kindly sent me from Berlin. It was collected at Menzies by Dr. Diels (No. 5141).

(To be continued.)

THE POSSIBLE USE OF ESSENTIAL OILS IN PLANT LIFE.

By George Henderson, M.D., F.L.S.

Everybody knows that moisture in the air tends to prevent frost at night, but it is not always realized that moist air, even when clear and when there are no clouds, acts in the same way, and stops radiation from the ground.

Tyndall, experimenting on this subject (see his *Fragments of Science* (1871), p. 201), found that infinitesimal quantities of essential oils in the air increased enormously its power of absorbing heat rays of low tension. I am not aware that anyone has suggested that this fact serves any useful purpose in plant life, but it seems to me that in this way these oils may often prevent injury from

frost at one of the critical periods of the plant's life—namely, when the fruit is setting.

In the low hills of the Punjab Himalaya, from one thousand to four thousand feet above the sea and ten to twenty miles across, at the end of March and in April, when most of the plants are coming into flower, one would expect the blossoms to be blighted by late frosts; but at that season the air is filled with the odours of essential oils from these blossoms, to such an extent as to be at times, especially on a still night, quite overpowering.

My theory is that these essential oils help to prevent radiation at night, and thus preserve the blossoms and allow the fruit to set; for it is in that locality only a matter of four or five degrees fall of temperature, just at sunrise, which does all the damage.

I mention the Punjab Himalaya because it was there that this matter first attracted my attention, and probably nowhere else is there such risk from late frosts.

Tyndall states that taking the absorptive power of dry air at 1, moisture in the air increases this to 72; but an infinitesimal trace of oil of rosemary gives 74, of oil of laurel 80, of camomile flowers 87, of cassia 109, of spikenard, 355, of aniseed 372. I do not know if Tyndall's experiments have been followed up; if not, I think this would form an interesting subject for further investigation.

SHORT NOTES.

Nomenclature of Breweria.—The plant which stands in *Index Kewensis* as "Breweria africana Benth. & Hook. f. Gen. iii. 877" has received two other names under the genus, one of which (and that the one which I think must stand) is not included in the first Supplement, while the other is there retained as a separate species. The combination cited is not to be found in the *Genera Plantarum*, but is attributed to Bentham and Hooker because they sink *Prevostea africana* in *Breweria*; those however who claim priority for the earliest trivial will no doubt adopt it, though it is noteworthy that Prof. Oliver does not do so in Ic. Pl. under *B. Heudelotii*, but publishes a new name for the plant. The earliest name for the plant under *Breweria* is *B. alternifolia* Radlk.; the synonymy is as follows:—

Breweria alternifolia Radlk. in Abhandl. nat. Ver. Bremen, viii. 413 (1883).
Codonanthus africanus G. Don, Gen. Syst. iv. 166 (1837).
C. ? alternifolia Planch. in Hook. Ic. Plant. t. 796 (1848).
Wilberforcia Hook. f. mss. ex Planch. l. c.
Prevostea africana Benth. in Niger Flora, 469 (1849).
Breweria africana "Benth. & Hook. f."; B. D. Jackson, Index Kewensis, i. 337 (Sept. 1893).
B. Codonanthus Baker ex Oliv. Ic. Pl. sub t. 2276 (Jan. 1894).

James Britten.

Kentish Plants.—The following critical forms were gathered last July by me:—*Plantago Coronopus* L. var. *ceratophyllon* Rapin. Mr. E. G. Baker names thus some luxuriant specimens from Shakespeare's Cliff near Dover.—Var. *tenuisectis-hirsuta* Wirtg., on the shingle at Dungeness.—*Agropyron repens* × *junceum*. Prof. Hackel names a grass which was not uncommon on the sands at Littlestone-on-Sea as this hybrid. It grew in association with both the assumed parents, and is probably the *A. acutum* of English authors for the greater part.—*Festuca rubra* L. var. *juncea* Hackel, Littlestone-on-Sea, growing in the sand, doubtless the var. *arenaria* of many authors.—*Bromus hordeaceus* L. var. *confertus* (Mab.) = var. *contractus* (Lange), Littlestone-on-Sea; new to district 10.—*Agrostis alba* L. var. *coarctata* Hoffm., Littlestone-on-Sea.—G. Claridge Druce.

Isnardia palustris L. Sp. Pl. p. 120, 1753 (*Ludwigia apetala* Walt. Fl. Carol. 89, 1788).—The mention by the Rev. E. F. Linton (p. 43) of two additional stations for this rare species, called to my mind a station not given by Mr. Townsend in his *Flora of Hampshire*, which is probably one of those named by Mr. Linton. In the *Phytologist*, iii. 1098 (1850) (foot-note), under *Leersia oryzoides*, Dr. W. A. Bromfield says: "I was fortunate to discover a third Hants station for the *Isnardia* on the 25th of August last, namely in a damp spot (apparently a waterway in the winter months) in the heart of the New Forest, between two of the branches or tributaries of the Boldre river, a little to the north-west of New Park Enclosure, and about two miles in the same direction from Brockenhurst Bridge, an exactly similar locality to that of the *Isnardia* on Petersfield Heath, and where it occurs as there in plenty with *Helosciadium inundatum* and *Peplis Portula* for its associates." There seems to be some discrepancy with regard to the date of refinding of the species on Petersfield Heath. Mr. J. Barton says (Phyt. ii. 223, n. s., 1857) that his father found it there "some twenty years back." Mr. Townsend has "1835?" as the date of this finding. But in the herbarium of the York Philosophical Society there are specimens from Dr. Bromfield (Herb. Dalton) from the locality dated 1830. Mr. Townsend's last date for Petersfield Heath is 1848; but I have a specimen gathered by Mr. C. Collins in 1852. Since that date I have been unable to trace it there, and Mr. Beeby and I searched for it unsuccessfully some years ago. Mr. Borrer found it in Sussex in 1827; it was gathered about 1843 by W. W. Reeves, but since that date I cannot ascertain that anyone has found it. In August, 1873, I made a careful but unsuccessful search for it. It seems to be quite extinct at St. Peter's Marsh, Jersey; the last specimens I have seen were dated 1874.—Arthur Bennett.

Cumberland Plants.—While at Keswick, last August, I gathered in Borrowdale some eyebrights which Mr. Townsend has kindly identified as follows:—*Euphrasia borealis* Towns. (with some slight doubt), *E. gracilis* Fries, *E. nemorosa* H. Mart., and *E. curta* Fries var. *glabrescens*. *Epilobium roseum* × *montanum* grew on the slate-

quarries in Borrowdale with *E. montanum* forma *minor*.—G. Claridge Druce.

South Hants Localities.—The station for *Lepidium ruderale* (p. 42) should have been entered as Keyhaven. I would add to the list, on the same page, *Malva parviflora* L., which occurred with *M. pusilla* Sm. and other casuals in a field run wild, VIII. (3) by the station, Porchester.—E. F. Linton.

NOTICES OF BOOKS.

Prodromus Floræ Britannicæ, part 3. By Frederic N. Williams. Brentford, Middlesex: C. Stutter. Price 4s. 6d., including postage. November, 1902.

After a moderate delay the third, and so far the largest part, of this new British flora appeared about the last month of last year; it consists of a hundred pages, in addition to three pages of explanatory matter on the cover, and after finishing the genus *Crepis* (*C. succisifolia* and *C. paludosa*) is devoted to "a revision of the British *Hieracia*." In attempting this revision Mr. Williams has found it necessary to work through a large series of the forms occurring in Scandinavia, Central Europe, and France; in the introductory remarks he instances some of the salient characters applicable to the genus, as follows:—Glandular hairs are in certain groups altogether absent, or occur only on the scales of the involucre mingled with other hairs in a very small proportion and almost concealed by them. In another group the glandular hairs are collected mainly at the base of the involucre and on the secondary pedicels, a few on the stem, and none on the leaves. In other groups the glandular hairs are less unequally proportioned to the simple hairs on the secondary pedicels, and absent from the upper part of the stem and from the leaves, or, as in the Alpina section, glandular hairs exist on the leaves, though sometimes only in small quantity. Another character, which the author considers primarily important, and which he says has been entirely overlooked, deals with the structure of the alveolar depressions on the receptacle; this character distinguishes the sections Cerinthoidea and Oreadea from the section Vulgata. "Another important character is to be found in the stem-branching. In those species in which the stem is branched above the cladophore a definite arrangement obtains in different groups. In one group the furcation is determinate, in another it is indeterminate with the branches alternate. In polycephalous forms, such as the common *H. silvaticum* Gouan, of the woods and on the rocks of hilly districts, the primary branching is botryose, and the secondary and terminal branches determinate, cymose, or sometimes pleiochasial or even umbellate. In descriptions this branching has been often loosely given as paniculate or corymbose, which conveys little information.

In most cases it affords a reliable specific character when associated with other group-characters."

The author recognizes 75 species within the area of the flora, which includes Ireland and the Channel Islands as well as Great Britain, but the account of the three last species, *H. auratum*, *H. crocatum*, and *H. sabaudum*, is left over for the next part.

In the last edition of the *London Catalogue*, published in 1895, the names of 104 species of *Hieracium* are enumerated, but 3 of these are indicated as aliens, and are not therefore included by Mr. Williams; of the remaining 101 species in the *Catalogue*, 12 are not quoted by Mr. Williams; and whether *H. maritimum* Hanb. is intended to be dealt with will appear when the account of the genus is finished in the next part. On the other hand two species, published since the date of the *Catalogue*, are included, and one species, *H. rotundatum* Kit. (1814), not named in the *Catalogue*, has been recognized among the materials in the British Museum Herbarium. In the revision full descriptions in Latin are given of the genus, subgenera, series, subseries, sections, subsections, and species; thus a good synopsis is supplied, and much original work has been spent in the course of it; also historical information with reference to the British hawkweeds is given.

There are some considerable changes in nomenclature. The name *H. murorum* L. is rejected for British plants, and the species usually so called appears under the name of *H. silvaticum* Gouan. "Linnæus described *H. murorum*, var. α, var. β, and var. γ. The second, which Linnæus called var. *sylvaticum*, Gouan raised to specific rank as *H. sylvaticum;* and its rank as a species has not been assailed. He added two other varieties, which, however, do not impair the stability of the species. Fries took out var. α, and called it *Hieracium cæsium*. It is obvious, therefore, that if the Linnean name be retained at all, which is certainly desirable, it should be made to apply to var. α, and not to var. β." It would be interesting to determine var. γ of the Linnean species, for it was defined as "Hieracium macrocaulon hirsutum, folio longiore. *Ray. Angl.* 3, p. 169"; can it be Hieracium leptocaulon hirsutum, folio longiore, Ray Syn. 169, which is the basis of *H. maculatum* Sm. and was a Westmoreland plant? An account of Ray's latter plant is given in his Hist. Plant. iii. p. 138, n. 5 (1704).

The 75 species kept up consist of 4 published by Linnæus in 1753, 1 of Gouan in 1773, 3 of Villars in 1779 and 1789, 2 of Willdenow in 1804, 1 of Tenore in 1811, 1 of Mérat in 1812, 2 of Kitaibel in 1814 and 1815, 11 of Fries in 1819–1862, 1 of Tausch in 1828, 1 of Gibson in 1843, 7 of Backhouse in 1855 and 1856, 1 of Hartman in 1870, 2 of Almquist in 1871 and 1893, 6 of Lindeberg in 1872–1889, 1 of Syme in 1879, 1 of Lönnroth in 1882, 14 of Hanbury in 1888–1894, 2 of Elfstrand in 1890 and 1893, 2 of W. R. Linton in 1890 and 1901, 1 of Beeby in 1891, 3 of E. F. Linton in 1891 and 1893. 1 of E. S. Marshall in 1892, 2 of Dahlstedt in 1893 and 1902, 2 of Purchas in 1895 and 1899, 1 of Ley in 1900, and 2 of F. N. Williams in 1902; thus more than

half of them have been published as species in or since 1872; *H. crebridens* Dahlst. *ms.* is described for the first time, p. 144, the description being taken from the specimens in Herb. Hier. Scand. iii. nn. 65, 66, and xiii. n. 58, and the *London Catalogue* number being 952*n*, *H. murorum* var. *crebridens* Dahlst. Other novelties are *H. pseudopilosella* Tenore, var. *atrichidium* Williams, p. 93; *H. Pictorum* E. F. Linton, var. *Breadalbanense* Williams, p. 130; and *H. lævigatum* Willd., subsp. *phyllopodioides* Williams, var. *gothicum* Zahn, forma *integrifolia* Williams, p. 166.

H. Leyi Hanb. Lond. Cat. n. 927, is removed from the group Oreadea to the Cerinthoidea and placed under *H. anglicum* Fries; *H. Langwellense* Hanb., Lond. Cat. n. 923, and *H. Carenorum* Hanb., Lond. Cat. n. 928, are also referred to *H. anglicum* Fries. *H. cæsium*, Lond. Cat. n. 958, is considered to differ from the species so named by Fries, and is identified with *H. flocculosum* Backh. *H. stenolepis* Lindeb., Lond. Cat. n. 945, is referred to *H. bifidum* Kit., and its variety, *H. stenolepis* var. *anguinum* W. R. Linton, Lond. Cat. n. 945 *b*, becomes *H. bifidum* var. *anguinum* Williams. *H. zetlandicum* Beeby, Lond. Cat. n. 982, is removed from the group Alpestria to the section Vulgata, subsection Bifida, on account of the colour of the fruit and the absence of many leaves on the stem. *H. centripetale* Hanb., Lond. Cat. n. 912, is removed from the group Alpina Nigrescentia to a subsection, Trichopetala, of the section Vulgata. *H. submurorum* Lindeb., Lond. Cat. n. 913, is removed from the Alpina to a subsection, Silvatica, of the section Vulgata. There are several other systematic changes, including the sinking of species, as treated in the *London Catalogue*, into varieties, and conversely the elevation of varieties into species.

In the course of the descriptions counts are recorded for 17 species or varieties as to the average number of bristles on the achenes; if the same trouble had been taken in all or nearly all cases, it would be possible to judge whether this character would prove serviceable for systematic purposes; in the instances given the numbers, arranged in ascending series, are as follows:—

24 in *H. Backhousei* Hanb.
25 in *H. petiolatum* Elfstr., *H. lingulatum* Backh., and *H. hypochæroides* Gibs.
30 in *H. surreianum* Hanb., *H. Dewari* Syme, *H. pulchellum* Lindeb., *H. perthense* Williams, and *H. lævigatum* Willd. var. *gothicum* Zahn.
32 in *H. cymbifolium* Purchas.
33 in *H. nigrescens* Willd. var. *gracilifolium* Hanb.
35 in *H. clovense* E. F. Lint., and *H. aggregatum* Backh. var. *prolongatum* Hanb.
45 in *H. rigidum* Fries.
50 in *H. aggregatum* Backh. (typical form).
55 in *H. holophyllum* W. R. Lint.
75 in *H. crebridens* Dahlst.

As regards the geographical distribution, 30 species appear to occur in Scotland, but not in England or Ireland; 15 in both

England, Scotland, and Ireland; 12 in England and Scotland, but not in Ireland; 9 in England, but not in Scotland or Ireland; 5 in Scotland and Ireland, but not in England; 4 in England and Ireland but not in Scotland; and none are peculiar to Ireland. It thus follows that 62 species occur in Scotland, 40 in England, and 24 in Ireland.

So far as information is available, 33 species may be considered endemic in the British Isles.

In a genus presenting such formidable difficulties as does *Hieracium*, it will take the skill of a specialist to form a just opinion on the permanent value of this work; but botanists generally, who may not have given prolonged study to these plants, cannot fail to appreciate the great benefit of the thorough revision, the complete synopsis, and the detailed descriptions, which are now placed at their disposal.

W. P. Hiern.

Nature Studies (*Plant Life*). By G. F. Scott Elliot, M.A., &c. 8vo. Pp. 352. Blackie & Co. Price 3s. 6d.

In general outline and treatment this volume, though considerably smaller in size, reminds us of Kerner's *Pflanzenleben*. The author has had much experience in field botany, both at home and in the tropics, and is thus well qualified by his own observations to write upon the subject. He lays down as a primary axiom that every detail in the structure of a plant has both a history and a meaning; his aim has been to point out how the student can follow, at any rate in part, the former and discover the latter.

The volume is primarily intended for members of natural history societies in the country, and for those engaged as teachers in our elementary and higher schools. Only such technical terms as are absolutely necessary are used; it can however be recommended to a much wider circle; in fact, any student of the mystery of plant-life will here find matter both interesting and suggestive.

The work covers so wide a field we can only refer to one or two points. In the first chapter the author, who has paid much attention to insect visiting and fertilization, arranges flowers in twelve classes according to the character of their visitors. The chapter on Fruits and Colonization by Seed contains an interesting table showing how very varied are the parts of the fruits or seeds utilized for transport.

Chapter iv. contains a table showing the pressure which seeds are able to support without breaking. The most interesting of the results were obtained by a Wickstead machine. The breaking weight for the pericarp of a Brazil-nut is stated to be 5708 lbs.—a statement, we think, to be received with some hesitation.

The chapter on Ferns, Fern Allies, and Fossils might be improved by more frequent reference to the works of Drs. Scott and Williamson on the Affinities of the Vascular Cryptogams of the Coal Measures; and in the chapter which deals with the

history of our native plants little use is made of Mr. Clement Reid's *Origin of the Br tish Flora*, which seems to us indispensable to anyone writing on the subject.

The work is illustrated by forty-three figures, which have been in almost every case either drawn from nature, photographed direct from the plant, or sketched on the blackboard (from microscope when possible) and then photographed.

We have derived considerable pleasure from this readable little volume, and trust that it will have a good circulation.

E. G. B.

BOOK-NOTES, NEWS, &c.

Richard Chandler Alexander Prior, who died at his London residence in York Terrace, Regent's Park, on the 8th of last December, was born at Corsham in Wiltshire, March 6, 1809. He was a descendant of Matthew Prior, the poet, was educated at Charterhouse and Oxford, and became Fellow of the Royal College of Physicians in 1840. He soon abandoned medical practice, and in 1841 took up his residence at Gratz, where he devoted himself to the study of botany. Here he lived about three years, during which he visited Croatia, Dalmatia, Italy, and Sicily. In 1846 he went to South Africa, where he stayed two years; in 1849 he went to Canada and thence to Jamaica, where he spent about a year, during which he investigated the Blue Mountains and the north of the island, and formed a considerable herbarium. In 1849, owing to the death of a near relative, he came into possession of large property at Halse, near Taunton, and added the name of Prior to his former patronymic of Alexander. From this time he devoted himself to his favourite pursuits, which were numerous and varied; he was keenly interested in literature and art, and a leading authority on croquet. For many years Prior was a constant attendant and a frequent exhibitor at the meetings of the Linnean Society, of which he became a Fellow in 1851. His principal work was his *Popular Names of British Plants*, of which three editions appeared, the first in 1863, the third in 1879; the author's qualifications as linguist, philologist, and folklorist combine to render this a standard work, although occasionally a somewhat far-fetched derivation is accepted in preference to a more obvious one on somewhat insufficient grounds. In this subject Prior always continued to take an interest, and he gave much help and encouragement to Messrs. Britten and Holland when compiling their *Dictionary of English Plant Names*. His botanical publications were not numerous; they include two papers on botanical excursions in Styria, published in Ann. Mag. Nat. Hist. 1846, and notes on the botany of Jamaica in Hooker's *Journal of Botany* for 1850. His help is, however, acknowledged by Harvey in the *Flora Capensis*, and Grisebach speaks of him as "one of the chief promoters" of his *Flora of the*

British West Indies (in which work the genus *Prioria* is established in his honour), and as possessed of a "rich private herbarium." He presented Jamaica plants to Grisebach and to Kew, those from the Cape to Kew and the National Herbarium, which latter also contains his European collections. An interesting character sketch of Prior by "Corycius Senex" (Rev. W. Tuckwell) will be found in the *Gardeners' Chronicle* for Dec. 20, 1902.

The "Contribution to the Fresh-water Algæ of the North of Ireland," by Messrs. W. and G. S. West in Trans. R. Irish Acad. xxxii. B. 1), is a valuable addition to our knowledge of Irish botany. The districts investigated included Donegal, and parts of Co. Londonderry, Co. Down, Co. Wicklow, and Co. Louth. The Wicklow collections, though not belonging to the North of Ireland, are included, either for convenience or merely as a confirmation of previous records for that county. The list contains 614 species and 107 varieties included in 139 genera, and of these species 24 are new records for the British Isles, while about a dozen species are described as new to science. Many others, though previously recorded from other parts of the British Isles, have not hitherto been found in Ireland. The authors note as remarkable the absence or rarity of *Vaucheria* in many parts of Ireland, as well as the great scarcity in the North of Ireland of *Euastrum insigne*. The three Desmids, *Micrasterias furcata*, *Staurastrum Arctiscon*, and *S. longispinum*, faithful to their traditions of living only in the west of each of the British Isles, are only known from lakes in the hilly districts of Connemara and Donegal. A certain time was devoted in May, 1900, and August, 1901, to the collection of Plankton-Algæ of Lough Neagh, including Lough Beg, and two nets of miller's silk were used with success. Considerable difference was noticed in the material collected on the two occasions, and a tabulated list is drawn up, to show a comparison between them. Many species which till now have been recorded exclusively from among the freshwater Plankton flora of the Continent are here shown to occur in Lough Neagh. The principal part of this paper is given up to the list of Algæ found in the districts examined, and in many cases critical notes are appended. The new species and varieties, as well as other specially interesting forms, are figured in three plates.

At the meeting of the Linnean Society on Feb. 5th, Professor F. W. Oliver read a paper "On *Stephanospermum*, Brougniart, a genus of fossil Gymnospermous seeds," which was illustrated by lantern-slides, drawings on the blackboard, and models. The communication was restricted to a consideration of two seeds from the Stephanian of Grand Croix, respectively *Stephanospermum akenioides* Brongn., and a new seed which the author proposes to name *S. caryoides*. Special attention was drawn to the pollen-grains found in the pollen-chamber of these two seeds, which were described at length, and a few grains of unknown pollen were shown to occur occasionally. The complexity of these seeds as compared with those of recent Cycads and other Gymnosperms was pointed

out, and a hypothetic scheme was shown to demonstrate a possible transition from one type to the other.

A HANDSOME volume on *English Pleasure Gardens*, by Rose Stanish Nichols (large 8vo. cloth, pp. xxii–319; price 17s. net), comes to us from the Macmillan Company, New York. It is a comprehensive, careful, and readable history of gardening from classic times down to the present day, embellished with numerous small illustrations in the text, which do not always come out very clearly, and a large number of excellent full-page blocks, taken from old books and modern photographs. The author has given, in reasonable compass, the result of a very complete course of reading, and has added to the value of the book by an excellent bibliography and a very full index. The volume should stand on the shelf next to Miss Jekyll's book, to which it forms an admirable pendant.

MESSRS. FISCHER, of Jena, are issuing what promises to be an excellent series of *Vegetationsbilder*, edited by Dr. G. Karsten and Dr. H. Schenck. The series is to comprise eight parts, with six plates in each, and the subscription price is M. 2.50; a single part costs M. 4.00. The plates, which are quarto size, are reproductions from photographs, and each is accompanied by a sheet of explanatory text. If the standard of the first two parts is maintained, Messrs. Fischer wlll add another to the useful and inexpensive botanical works for which they have gained a reputation. Part 1, by Dr. H. Schenck, depicts South Brazilian vegetation, and includes two plates illustrating the rank dense growth in the tropical rain forest, an excellent habit-figure of *Cocos Romanzoffiana*, a group of the ant inhabited tree *Cecropia adenopus*, a dead stem bearing epiphytes, and a wood of *Araucaria brasiliana* on the highlands of the state of Parang. The last-mentioned plate gives a somewhat disappointing idea of this important southern conifer, and suggests that the highlands in question do not yield the most favourable conditions for its growth. Part 2 illustrates plant-life in Java and Molucca, and is by Dr. Karsten. It comprises chiefly forest vegetation, and includes a presumably good representation of the *Nipa* palm formation. It would be well if, in such cases as the picture of epiphyte vegetation, some indication were given of the actual size of the objects.

PROFESSOR SARGENT has issued two supplementary volumes of his *Silva of North America*, in which the work is brought up to date by the addition of such arborescent species as have been added to the flora since the work was begun in 1890. Those who have followed the course of American botany as traceable in periodicals will not be surprised to find that one of the volumes is almost entirely occupied by descriptions and figures of recently described species of *Cratægus*, sixty-nine in number; these admirable plates and detailed accounts will be of the greatest value in discriminating these nearly allied species. Several pages of corrections and an admirable general index complete a work which the author may well be proud to have produced.

The Hon. Mrs. Evelyn Cecil, whose *History of English Gardens* was an important contribution to our knowledge of historical horticulture, has written a very pretty and useful little book on *Children's Gardens*, which Messrs. Macmillan publish. It contains a great deal of information, botanical as well as agricultural, conveyed in a pleasant manner, and is well suited to give young folks an intelligent interest in one of the most delightful of pursuits. The volume is well illustrated and beautifully printed.

The death of William Arthur Glasson (who was born at Hayle, 29 May, 1828), which took place on Jan. 14 at Lescudjack, near Penzance, has deprived West Cornwall of one of its most ardent local botanists. His help is acknowledged in Mr. Davey's *Tentative List* of Cornwall plants; a paper from his pen "On the Occurrence of Foreign Plants in West Cornwall" will be found in the Transactions of the Penzance Natural History Society for 1888–89, pp. 62–69. During the later years of his life Glasson took up the study of mosses.

The University College of Wales Scientific Society has published a "List of the Flowering Plants and Ferns of Aberystwyth and Neighbourhood" (Gilson, Aberystwyth), by Prof. J. H. Salter, D.Sc., which "contains the names of all the species which have been recorded upon reliable authority for North Cardiganshire." It contains little else, although there are a few localities, but the "names" include both Latin and book-English. No authorities are appended to the Latin names, and, with hardly an exception, the trivials begin with a capital letter. About 700 species are enumerated, but "the flora, though not without features of interest, is by no means a rich one."

Mr. R. W. Goulding sends us an interesting paper on "Martin Lister, M.D., F.L.S.," reprinted from the Report for 1900 of the Architectural and Archæological Society of Lincoln and Nottingham. It contains a large number of letters to and from Lister, copied from MSS. in the Bodleian; among his correspondents were Dr. Plot, Edward Lhuyd, and Sir Hans Sloane. There is nothing especially relating to botany of interest in the collection, which however is interesting in many ways.

The extremely useful *Flore descriptive et illustrée de la France* (Klincksieck, Paris), by the Abbé Coste, has reached the third part of its second volume, and brings the enumeration down to *Achillea*. Each description is accompanied by a small but characteristic figure, which should be of great help in determining the species. When completed, this will take rank among the most useful of European floras.

A chair of Botany, to be called the "Harry Bolus" Chair, has been established at the Cape Town University. Its first occupant will be Mr. H. H. W. Pearson, of Kew. Mr. S. T. Dunn is succeeding Mr. Ford at the Hong Kong Botanic Gardens.

Mr. Charles Bailey prints, in the Memoirs of the Manchester Literary and Philosophical Society (vol. xlvii. part I.), the interesting paper on the adventitious vegetation of the sandhills at St. Anne's-on-the-Sea, of which we gave an abstract on p. 429 of our last year's volume. The paper is illustrated by figures of *Ambrosia artemisiæfolia* and *Vicia villosa*.

The latest attempt to make a satisfactory classification of the European species of the difficult *Harpium*-section of *Hypnum* is that of C. Warnstorf (*Beihefte zum Botanischen Centralblatt*, xiii. 1903, pp. 388–430, tabb. xiii., xiv.). He gives a summary of the schemes put forward by Sanio, Renauld, Klinggraeff, and Limpricht, discusses the general anatomy of the plants, and sets out his own views as to their classification. He prefers *Drepanocladus* C.M. as the generic name, *Harpidium* having been employed to denote a genus of lichens. He has drawn up a detailed key to the twenty European species, arranged in several sections, and after describing in full some of the less known species with their varieties and forms, he concludes with some critical remarks.

We note that Dr. Andrew Wilson, apparently not for the first time, has been attacking the Natural History Museum, on the ground that it is a close preserve for specialists, and that no oral explanations are given "to those utterly ignorant of science." It may be doubted whether any instruction that could be given in the Museum would benefit those whose ignorance is so complete as Dr. Wilson suggests; but it does not seem that he himself is at all well informed as to what the Museum does or does not do. This is shown by a letter from Mr. E. A. Martin in the *Daily Chronicle*, the paper in which Dr. Wilson brought his accusation. Mr. Martin writes, under date Feb. 16:—"Dr. Andrew Wilson scarcely does justice to the authorities at the Natural History Museum at South Kensington. We have always found them most willing to provide a member of the staff to conduct our Society over the various galleries of the Museum. During the last four years, many visits have been arranged on Saturday afternoons, and amongst those who have extended their courtesy to us I would mention Dr. H. Woodward, Mr. W. Carruthers, Dr. A. Smith Woodward, Mr. Pyecraft, Dr. Rendle, and others. On Saturday last, Dr. Rendle conducted the Selborne Society over the Botanical Gallery, and at the same time there were parties from the Microscopical Society, and from the Birkbeck Institute, who were enjoying the same courtesy—three different parties on one afternoon." It will be remembered that at the annual meeting of the Selborne Society in 1900, Mr. Boulger referred in complimentary terms to the courtesy invariably extended to the Society on their visits to the Museum, which he contrasted with the prohibition of any attempt at oral explanation on the occasion of their visits to Kew Gardens.

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J Cryer anal
S C Hendrey del et lith.

West, Newman imp

Polygala amarella *Gaertz.*

POLYGALA AMARELLA Crantz IN YORKSHIRE.

(Plate 450.)

I.—By William West, F.L.S.

A Polygala gathered in flower by Mr. H. Andrews at Grassington, near Skipton, nineteen years ago, was shown to me, and, fruiting characters being absent, was considered as possibly *P. calcarea*. Last year Mr. John Cryer, of Bradford, whose note on the locality follows, collected a series of specimens, some of which were submitted to Prof. Chodat, of Geneva, the monographer of the genus, who identified the plant as *P. amarella* Crantz. Mr. Cryer has asked me to draw up the description of the plant, which follows:—

Rhizome (of well-developed plants) branching, each branch bearing several flowering stems from 25 to 150 mm. high, barren stems very rarely produced; leaves sessile, alternate, lower ones rather crowded, but not forming a distinct rosette, obovate-spathulate, usually very obtuse, but sometimes bluntly pointed, rarely with a very short blunt apiculus, length usually from 15 to 30 mm., breadth from 5 to 8·5 mm.; the remaining ones inserted at distances apart of about one-fourth to one-half their length, uppermost ones always overlapping the lower part of the raceme, oblanceolate and pointed, length from 12 to 18 mm., often more, breadth from 2·5 to 4 mm.; racemes terminal, from 12 to 65 mm. long; flowers dark blue, spreading, drooping when fruiting, pedicels about half their length; lateral sepals narrowly elliptic, always a little longer than the corolla, 4·5 mm. long, 1·8 mm. wide, about half as wide as the fruit, becoming green in fruit, 3-nerved, nerves almost simple, median one usually with a simple delicate branch on each side towards the apex, lateral ones with from 1 to 3 delicate branches on the outer side; capsule subcircular, not suddenly narrowed towards point of attachment, apex with a somewhite wide notch, pale, with a dark green border and vertical median band; seeds oblong, densely covered with short straight hairs; lobes of aril subequal, very obtuse, about one-fourth the length of the seed.

On examining the plant gathered nineteen years since I found that it corresponded with the plants recently collected. Prof. Chodat's determination is no doubt correct, but it is evidently a variable plant. The plants from Grassington had larger flowers than a specimen I compared them with from Wye Down; they are also considerably larger than the specimens of *uliginosa* Reichenb. from Cronkley Fell, averaging at least three times the size; so that they are probably a form of what has been known to English botanists as *P. austriaca* Crantz. The great majority of the plants from Grassington have their stems from three to six inches high, and their racemes from one inch to one and a half long. The number of flowering stems varies according to the age of the plants, young plants having but one stem, old plants having as many as

from seven to nineteen, with the remains also of dead stems of the previous year's growth.

A few specimens I have seen practically agree with the var. *uliginosa* as regards their dimensions. These were from a more elevated and exposed situation. Still by far the greater number of the specimens do not agree with the var. *uliginosa*, being far too large. There are, however, some plants of various intermediate sizes, and these are very interesting, as it points out that the plant, which regularly attains a height of five to six inches in somewhat sheltered places, tends to change, as the situation becomes more exposed, to a more dwarf and compact habit, until it attains not more than an inch, with a raceme of less than half an inch in length. As I understood from Mr. Cryer that this latter form also occurred in fair quantity, it points out that in this area the alpine form is connected with the largest form within an area of two square miles. I also noticed in plants which were hardly an inch in height that the upper leaves still had the same character of length and pointedness possessed by the tall plants; these leaves in the dried dwarf plants covered much of the raceme.

I have carefully compared the West Yorkshire plants with those of *P. calcarea* N. Schultz from many localities, and I find that it differs from the latter species in having its lateral sepals *much narrower* than the capsule, and not *almost as broad*;* the base of the capsule is *rounded* and not *rather suddenly narrowed*, the lobes of the aril are *blunter*, *shorter*, and *more equal in length*, the lowermost obovate-spathulate leaves have the narrow basal part *much longer*, usually twice as long, the upper leaves are also *relatively longer* and *more pointed*, the flowers are also *smaller*, the *branching of the veins* is also *more simple*, the rhizome is somewhat branched so that the older plants have the origin of their flowering stems more scattered, the flowers are also fewer, and the stems distinctly straighter.

Mr. N. E. Brown, in the *Supplement* to the Third Edition of English Botany (p. 34), identifies *P. calcarea* Schultz with *P. amarella* Crantz, but this view is not accepted by Prof. Chodat.

II.—By John Cryer.

During last Whit-week I brought from Grass Woods, Grassington, near Skipton, a few specimens of a beautiful Polygala which had attracted my attention. Its beautiful blue small flowers, its crowded racemes and the number of them, its large spathulate radical leaves, indicated to me that it was not the well-known *P. vulgaris* subsp. *depressa* Wend., which is so common in this district in late June, July, and August.

Having a cottage near Grassington, I have been able to spend many weeks in investigating this interesting plant, its varied forms, its distribution, &c. I have found it fairly well distributed over an

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* The Floras say, *as broad* and some *broader*; this is not the case in dried specimens. *P. oxyptera* has the lateral sepals *shorter* as well as narrower than the fruit.

area four miles by two as the crow flies. This area embraces Grass Woods, Bastow Wood, Dibb Scar, Lea Green, Sweet-side, Conistone Old Pasture, Skythorns, Bordley, and the immediately adjacent ground. This area is occupied principally by the Great Scar limestone, the Yoredale rocks, and the millstone grit. It is cut into two parts by the Craven fault, on the south side of which the Pendleside limestone, with knoll-reefs and occasionally outcrops of Bowland shales, is much in evidence. I have not yet discovered the plant off the Great Scar limestone.

Depth of soil, shelter, aspect, and especially altitude, exercise a wonderful influence in modifying the size and character of the plant. For instance, with a southern aspect, well sheltered, and at an altitude of 750 ft., I found plants with no less than from nine to eighteen flowering stems each. These plants, as a rule, were very compact, and had well-developed rosettes of radical leaves; whereas those growing on exposed portions of rock without much soil had a straggling habit, with little or no rosette. Each flowering stem was from 4 to 6 in. high, and each raceme 2 to 3 in. long, crowded with flowers. With a northern aspect, well sheltered, and at an altitude of 700 to 750 ft., the plants were long and straggling. Many had a loose rosette of four or five large spathulate leaves, $1\frac{1}{8}$ in. long and $\frac{1}{3}$ in. broad in the widest part. The flowering stems were $4\frac{1}{2}$ in. high, the racemes $1\frac{1}{2}$ in. long, and sparsely crowded with flowers. In many examples the rosette had disappeared altogether. In exposed positions, and at altitudes ranging from 800 to 1000 ft., the plants were very small, with one to two flowering stems each, and these often not more than $\frac{3}{8}$ in. high, the racemes being $\frac{3}{8}$ in. and carrying many flowers. Each plant I noticed at these altitudes had a dense well-developed rosette.

Examples of the two extremes are given in the plate.

Explanation of Plate 450.—*Polygala amarella* Crantz, from Grassington. Specimens. 1 & 2. Lateral sepals in fruiting stage, natural size, $\frac{3}{16}$ in. long, $\frac{1}{12}$ in. broad. 3. Lateral sepal, flowering stage; natural size, $\frac{3}{16}$ in. long, $\frac{1}{16}$ in. broad. 4. Fringe of staminal hood. 5. Pistil, $\frac{1}{12}$ in. in length. 6. Capsule, $\frac{1}{8}$ in. in length, $\frac{5}{32}$ in. broad. 7. Ripe seed, $\frac{1}{12}$ in. in length, $\frac{1}{24}$ in. broad.

MOSSES AND HEPATICS OF THE EAST RIDING.

By William Ingham, B.A.

The mosses and hepatics of the West Riding of Yorkshire have been well dealt with in Lees's *Flora of West Yorkshire*, and those of the north of the county have been similarly well handled in Baker's *North Yorkshire*; but there has not been a full and connected account of these plants in the East Riding, embracing the results obtained by the bryologists who have worked in this vice-county. It is the purpose of this paper to give such an account.

Very many mosses and hepatics and new habitats are added to

the lists published in the Transactions of the Yorkshire Naturalists' Union by Dr. Spruce and Dr. Parsons in 1878.

The East Riding, from the nature of its surface, cannot be expected to be as rich in these plants as the West and North Ridings, where we find more water, more shade, and a more varied surface of land. In spite, however, of its natural disadvantages, compared with the other Ridings, we are able to give a very good account, owing to the unusual number of bryologists who have worked in the Riding. These workers are indicated by their initials after the various habitats, and are as follows:—Dr. Spruce (*Spruce*); Dr. H. F. Parsons, late of Hull (*P.*); J. J. Marshall, of Beverley (*M.*); M. B. Slater, of Malton (*S.*); Robert Teesdale (*T.*); G. Webster, of York (*W.*); J. F. Robinson, of Hull (*R.*); besides others whose full names are given, as they appear casually only. Where no authority is given I am myself responsible. The habitats may be classed as follows:—

1. The glacial tract in the east, bordering on the sea, embracing such habitats as Withernsea, Garton, Grimston, Driffield, and Filey.

2. The chalk tract of the central wolds and of Flamborough Head.

3. The Jurassic tract of the north-west, cut through by the river Derwent, and taking in such habitats as Kirkham Abbey, Firby, North Grimston, and Settrington.

4. The alluvial tract in the west, including the siliceous bogs of Skipwith and Riccall Commons, and of Barmby Moor and Allerthorpe Common adjoining it. One important habitat has this year disappeared, *viz.* the large pool near Staddlethorpe Station, which has been filled up by the North-Eastern Railway Company for railway improvements. The large and fine siliceous bog on Skipwith Common is as wild as ever, and has every appearance of remaining so.

The order followed in this paper is Warnstorf for the Sphagna; *The Student's Handbook of British Mosses*, by Dixon and Jameson, for the remaining mosses; and the Moss Exchange Club Hepatic Catalogue for the hepatics. I am much indebted to Messrs. Dixon, Bagnall, Nicholson, Horrell, and Wheldon for verifying many of the mosses gathered by myself.

Sphagnum fimbriatum Wils. (var. *robustum* Braith.), with much fruit, Skipworth Common.—*S. acutifolium* Russ. & Warnst., Langwith Moor, *Spruce*, Riccall Common, *P.*—*S. subnitens* Russ. & Warnst. (var. *flavo-rubellum* Warnst.), in abundant fruit, Skipwith Common.—Var. *griseum* Warnst. and var. *virescens* Warnst., Skipwith Common.—*S. squarrosum* Pers., Langwith Moor, *Spruce*; Cliff Wood, *P.*; Tilmire.—*S. cuspidatum* Russ. & Warnst., Langwith Moor, *Spruce*; Riccall Common, *P.*; var. *falcatum* Russ., Barmby Moor and Skipwith Common; var. *submersum* Schimp., forming beds of large pools, and mixed with *Pilularia* (a large yellow growth), Skipwith Common.—*S. molluscum* Bruch, Langwith and Barmby Moors, *Spruce*; forma *compacta* Warnst., Skipwith Common and Barmby Moor.—*S. compactum* DC., var. *squarrosum* Russ., Riccall, *West*; var. *subsquarrosum* Warnst., Langwith, *W.*; Skip-

with Common and Barmby Moor; var. *imbricatum* Warnst., Skipwith Common; Langwith, *Spruce*; Riccall and Breighton Commons, *P.*—*S. contortum* (Schultz) Limpr., Skipwith Common.—*S. subsecundum* Limpr., Barmby Moor and Skipwith Common, on drier parts of the moors; Riccall Common, *P.*—*S. inundatum* Warnst., Skipwith Common.—*S. rufescens* Warnst., very abundant in pools, and very robust, *c. fr.*; Skipwith Common.—*S. crassicladum* Warnst., uniformly a vivid green, growing away from pools, Skipwith Common. — *S. cymbifolium* Warnst., Langwith Moor, *Spruce*; Riccall Common, *P.*; Skipwith Common; var. *fuscoflavescens* Russ. and var. *glaucescens* Warnst. (the common form), Skipwith Common; var. *glauco-pallens* Warnst., Skipwith Common, on dry moorland; var. *pallescens* Warnst. Skipwith Common.—*S. papillosum* Lindb. var. *sublæve* Limpr., forma *glaucescens*, a very pretty sphagnum, Skipwith Common.

Tetraphis pellucida Hedw., Kennythorpe, *S.*; Langwith, *W.*; Skipwith Common.

Catharinea undulata W. & M., York, *Spruce*; Cliff, *P.*; Market Weighton, Beverley, *M.*; Skipwith and Barmby Moor.

Polytrichum nanum Neck., Langwith Moor, *Spruce*; Market Weighton, *M.*; near Skipwith (*teste* Dixon).—*P. aloides* Hedw., Langwith Moor, *Spruce*; Market Weighton, *M.*—*P. urnigerum* L., near York, *Spruce*. — *P. gracile* Dicks., near Holme-on-Spalding Moor, *M.*; Skipwith, abundant, *W.*; Barmby Moor.—*P. formosum* Hedw., woods east of York, *Spruce*; Houghton Wood, *M.*; Buttercrambe, *W.*—*P. piliferum* Schreb., Barmby, Langwith, and other moors, *Spruce*; Holme, *P.*; Market Weighton, *M.*—*P. juniperinum* Willd., Barmby, Langwith, and other moors, *Spruce*; Holme, *P.*; Riccall, *W.*; Market Weighton, *M.*; Tilmire.—*P. strictum* Banks, Allerthorpe Common, *S.*, *M.*; Barmby Moor, M.—*P. commune* (L.), Skipwith, very abundant and very tall; var. *fastigiatum* (Lyle), Skipwith Common (*teste* H. N. Dixon).

Archidium alternifolium Schimp., Langwith Moor (in fruit), *Spruce.*

Pleuridium subulatum Rab., near York, on sandy places, *Spruce.*—*P. alternifolium* Rab., Langwith, &c., *Spruce*; Market Weighton, Beverley, *M.*

Ditrichum flexicaule, Hoppe, Brantingham Dale and North Cave, *P.*; Market Weighton, *M.*; Filey.

Seligeria paucifolia Carr., Goodmanham, *M.*; Dane's Dyke, Flamborough, *M.*, *I.*—*S. calcarea* B. & S., Bishop Burton, *T.*, 1797; Bishop Burton, Goodmanham, Etton, Beverley, *M.*; Dane's Dyke, Flamborough, *M.*, *I.*

Ceratodon purpureus Brid., Filey, Skipwith Common, Riccall, North Grimston (a marked form), and many other places.

Dicranella heteromalla Schimp., Riccall, *P.*; Market Weighton and Beverley, *M.*; Barmby Moor, Barlby, Filey; Langwith, *W.*—*D. cerviculata* Schimp., Brough, *P.*; Beverley and Market Weighton, *M.*; Skipwith Common and Barmby Moor.—*D. rufescens* Schimp., near York, stubbles, *Spruce*; Arras and Goodmanham, *M.*—*D. varia* Schimp., Kirkham Abbey, *S.*; Market Weighton, *M.*

Filey, *M.*; Selby; Sledmere, *W.*; var. *tenuifolia* B. & S., Market Weighton, Filey, *M.*; var. *callistoma* Schimp., Londesborough and Goodmanham, *M.* — *D. Schreberi* Schimp., Goodmanham Beck, *M.*

Campylopus pyriformis Brid., Houghton Wood, wood near Market Weighton, *M.*; Skipwith Common, *c. fr.*, and Barmby Moor, *c. fr.*—*C. flexuosus* Brid., Houghton Wood, *M.*; Langwith, *W.*; Skipwith Common, *c. fr.* On Skipwith Common occur two forms of *C. flexuosus* and *C. pyriformis*, forming interesting connecting links between these two species (*teste* Dixon); var. *paradoxus* Husn., Skipwith Common, *teste* Dixon.—*C. fragilis* B. & S., Riccall Common, *P.*; woods east of York, *Spruce*; Buttercrambe, *W.*; Barmby Moor, *M.*, and Skipwith Common.—*C. brevipilus* B. & S., Skipwith Common.

Dicranoweisia cirrata Lindb., thatch roofs near Barlby and Lund, *P.*; Market Weighton and Beverley, *M.*

Dicranum undulatum Ehrh., woods between Market Weighton and Holme-on-Spalding Moor, *M.*, 1896.—*D. spurium* Hedw., Houghton and Barmby Moors, *T.*; Barmby Moor, *c. fr.*, July, 1843, *Spruce*; Langwith and Woodhouse Moors, Market Weighton, Barmby Moor, *M.*; Skipwith Common and Barmby Moor, 1900, abundant under heather.—*D. Bonjeani* De Not., Langwith and Barmby Moors, *Spruce*; Cliff Wood and Skipwith, *P.*; Market Weighton, *M.*; Selby, Barmby Moor, a strange-looking state with rigid and squarrose leaves (*teste* Dixon); Skipwith Common, very abundant; var. *rugifolium* Bosw., Skipwith Common.—*D. scoparium* Hedw., woods near Ouse and Derwent, *Spruce*; Riccall and Holme, *P.*; Market Weighton, *M.*; Barmby Moor.—*D. majus* Turn., Cliff Wood, near Selby, *P.*—*D. fuscescens* Turn., a very small form on trees, Beverley Westwood, *M.*

Leucobryum glaucum Schimp., Langwith and Barmby Moors, *Spruce;* Howsham, *S.*; Riccall Common and Holme, *P.*; Houghton Wood, *M.*; Skipwith Common, abundant.

Fissidens exilis Hedw., Beverley, *M.*—*F. viridulus*, Wahl., Goodmanham and Beverley, *M.*—*F. pusillus* Wils., Middlethorpe and Beverley Westwood, *M.*; *F. incurvus* Starke, near York, *Spruce*; Beverley Westwood, *M.*; Naburn. — *F. tamarindifolius* Wils., Swinemoor, Beverley, *M.* — *F. bryoides* Hedw., Barmby Moor, Riccall, and many other places.—*F. adiantoides* Hedw., banks of Ouse and Derwent, *Spruce*; Drewton, *P.*; Market Weighton, *M.*; Skipwith Common, abundant and in fruit; var. *collinus* Mitt., on grassy chalk down, Dane's Dyke, Flamborough; cells 8 to 12 m.; Mr. Dixon says this may be taken as *F. collinus* Mitt., as far as description goes.—*F. taxifolius* Hedw., Howsham, *S.*; Welton and North Driffield, *P.*; Filey.

Grimmia apocarpa Hedw., wall near Whitewale, *S.*; Drewton and Brough, *P.*; Market Weighton, Sancton, *M.*—*G. pulvinata* Sm., Ellerker, *P.*; Market Weighton, *M.*; Dane's Dyke, Flamborough.

Rhacomitrium lanuginosum Brid., on Skipwith Common, one small tuft only seen. (At Kirkham Abbey, on the stones on the

north bank of the Derwent, occur *R. aciculare* Brid., *R. fasciculare* Brid., *R. canescens* Brid., and *Ptychomitrium polyphyllum* Fürnr., all of which no doubt occur on the East Riding side of the river).

Phascum cuspidatum Schreb., Brough, *P.*; abundant everywhere, *M.*; Barmby Moor; var. *Schreberianum* Brid., Naburn, on rich loose soil; very near to this var. at least.—*P. Floerkeanum* W. & M., near Kiplingcotes, *M.*—*P. curricolle* Ehrh., wolds between Beverley and Market Weighton, *T.*; near Kiplingcotes, *M.*; Goodmanham, *M.*—*Pottia recta* Mitt., with the last, *T.*; near Kiplincotes and Goodmanham, *M.*—*P. bryoides* Mitt., Market Weighton, Londesborough, *M.*; var. *pilifera* Schimp., roadside, Barmby Moor (*teste* Nicholson).—*P. Heimii* Fürnr., Brough.—*P. truncatula* Lindb. Sancton, Market Weighton, Beverley, *M.*; Barmby Moor, Naburn. —*P. intermedia* Fürnr., in gardens near York, *Spruce*; Naburn (*teste* Dixon); and probably this, being barren, Barmby Moor.—*P. minutula* Fürnr., Market Weighton, *M.*—*P. Starkeana* C.M., Kirkham, *S.*; near York, *Spruce*.—*P. lanceolata* C.M., Welham, *S.*; Welton, *P.*; Market Weighton, Kiplingcotes, Etton, *M.*

Tortula pusilla Mitt., Westow, *Spruce*; Ellerker, *P.*; Newbald, Sancton, Market Weighton, *M.*—*T. brevirostris* Hook. & Grev., gravel pit, Kiplingcotes, *M.* (this very rare moss I also found in Huddleston Quarry, Sherburn-in-Elmet).—*T. rigida* Schrad., gravel pit, Kiplingcotes, *M.*—*T. ambigua* Angstr., mud-capped walls, Westow, *Spruce*; near Kirkham, *S.*; Ellerker, *P.*—*T. aloides* De Not., Westow, *Spruce*; Kiplingcotes, *M.*—*T. muralis* Hedw., everywhere on walls; Dane's Dyke, Flamborough, with very long hair-points.—*T. subulata* Hedw., abundant on sandy soils; Filey, Selby; var. *subinermis* Wils., on side of pond, Staddlethorpe.—*T. angustata* Wils., Swinemoor, Beverley, *M.*—*T. mutica* Lindb., Kirkham, *S.*, near Pulfin, River Hull, *M.*—*T. lævipila*, Schwaegr., York Dale *S.*; Drewton and Brough, *P.*; Market Weighton, *M.*; Brantinghamthorpe, *W.*; Pocklington and Lockington.—*T. intermedia* Berk., Market Weighton, Drewton Dale, *M.*; Dane's Dyke, Flamborough.—*T. ruralis* Ehrh., Heslerton, *S.*; Brough, *P.*; Market Weighton, *M.*—*T. ruraliformis* Dixon, Spurn, on sandhills, *R.*; Spurn, *c. fr.*, *M.*—*T. papillosa* Wils., tree-trunks, York Dale, *S.*; Market Weighton and Withernsea, *M.*

Barbula lurida Lindb., Blacktoft, *P.*; Market Weighton, *M.*—*B. rubella* Mitt., abundant everywhere.—*B. tophacea* Mitt., Goodmanham, *M.*; Filey, *M.*; Naburn, very abundant, and crowded with fruit; Filey, forma *luxurians*, Braithw., very tall; Selby.—*B. fallax* Hedw., Brough, *P.*; Market Weighton and Beverley, *M.*; Sledmere, *S.*; Filey; var. *brevifolia* Schultz, Garton Cliffs, *W.*—*B. rigidula* Mitt., Broomfleet, *P.*—*B. Hornschuchiana* Schultz, Brough, *R.*; Market Weighton, *M.*—*B. convoluta* Hedw., Brough, *P.*; Market Weighton, in fine fruit, *M.*; var. *Sardoa* B. & S., on wall, North Grimston Station.—*B. unguiculata* Hedw., Driffield, Filey, Naburn, Dane's Dyke, Flamborough, and other places; var. *cuspidata* Braithw., on shady wall, Pocklington (*teste* Dixon).

Weisia crispa Mitt., Figham, near Beverley, *T.*; Goodmanham, *M.*—*W. microstoma* C. M., Norton, *S.*; Langwith Moor, *Spruce*;

Beverley, Market Weighton, Goodmanham, *M.*—*W. viridula* Hedw., Eddlethorpe, *S.*; Welton, *P.*; Market Weighton, *M.*; Filey.—*W. tenuis* C. M.; quarry near Birdsall, *S.*—*W. verticillata* Brid., side of Goodmanham Beck, *M.*

Trichostomum crispulum Bruch, Filey and Dane's Dyke, Flamborough.

Cinclodotus fontinaloides P. Beauv., Fulford, *S.*; Naburn Dam, *W. Smith*; Ouse, Selby.

Eucalypta vulgaris Hedw., North Cave, *P.*; Burdale, *S.*; Arras, *M.*; North Grimston Station.—*E. streptocarpa* Hedw., Market Weighton, *M.*; Goodmanham, *M.*

Zygodon viridissimus R. Br., Sledmere, *S.*; Brough and Holme, *P.*; Market Weighton, Filey, Welton Dale, *M.*; Kirk Ella, *W.*; Dane's Dyke, Flamborough, Howden, Naburn, Southburn.

Ulota Bruchii Hornsch., Sledmere, *S.*; Houghton Wood, *M.*—*U. crispa* Brid., woods by Ouse and Derwent, *Spruce*; var. *intermedia* Dixon, Cliff Wood, Selby, *P.*—*U. phyllantha* Brid., near York, Market Weighton, *M.*; Filey, *M.*, *I.*; Dane's Dyke, Flamborough, *M.*, *I.*

Orthotrichum anomalum Hedw., walls towards Elvington, *Spruce*; Goodmanham, *M.*; var. *saxatile* Milde, wall, Pocklington.—*O. cupulatum* Hoffm., walls towards Elvington, *Spruce*; stones of loch, Market Weighton Canal, *M.*—*O. leiocarpum* B. & S., near York, *Spruce*; *O. Lyellii* H. & T., trees near Sledmere, *S.* and *W.*; near Londesborough, *M.*; Dane's Dyke, *W.*—*O. affine* Schrad., Brough, *P.*; Goodmanham, *M.*; Birdsall, *S.*; Dane's Dyke, Flamborough. *O. tenellum* Bruch, on trees near York, scarce, *Spruce.*—*O. pulchellum*, Sm., Birdsall, *S.*; Dane's Dyke, Flamborough, *I.*, *M.* — *O. diaphanum* Schrad., Birdsall, Lockington, Pocklington.

Physocomitrella patens B. & S., near Norton, *S.*; Market Weighton, Swinemoor, Beverley, Goodmanham Beck, *M.*

Physcomitrium pyriforme Brid., Brantingham, *P.*; Market Weighton, Swinemoor, Beverley, *M.*; Driffield.

Funaria fascicularis Schimp., Langwith Moor, *Spruce.*—*F. ericetorum* Dixon, Langwith Moor, *Spruce.*—*F. hygrometrica* Sibth., Skipwith, and many other places; var. *calvescens* B. & S., in marsh, Naburn (*teste* Dixon).

Aulacomnium palustre Schwaegr., Langwith Moor, *Spruce*; Riccall Common (in fruit), *P.*; Houghton Moor, *M.* (very abundant, and crowded with fruit); and var. *laxifolium* Kdb., Skipwith Common.—*A. androgynum* Schwaegr., Langwith Moor, *Spruce*; Lund, *P.*; Market Weighton Common, *M.*; Osbaldwick, *W. Smith.*

Philonotis fontana Brid., *S.*, no locality given.—*P. calcarea* Schimp., Newbald Springs, *P.*

Brentelia arcuata Schimp., Houghton Moor (Withering), Langwith Moor, *Spruce.*

Leptobryum pyriforme Wils., on site of old brickyard, Market Weighton, *M.*

Webera nutans Hedw., common on heaths; var. *longiseta* B. & S. (in fine fruit), Skipwith Common.—*W. annotina* Schwaegr., Sand Hall, near Howden and Holme, *P.*; Langwith moor (in fruit),

Spruce.—*W. carnea* Schimp., Holme and Welton, *P.*; Market Weighton, *M.*; Garton-in-Holderness, *W.*—*W. albicans* Schimp., common in ditches.

Bryum pendulum Schimp., walls near York, rare, *Spruce*; Market Weighton, *M.*—*B. lacustre* Brid., Driffield.—*B. inclinatum* Bland, walls near Derwent, *Spruce*; Market Weighton, *M.*—*B. uliginosum* B. & S., Heslington fields, *Spruce*; Springwells, Market Weighton, *M.*—*B. pallens* Sw., Langwith Moor and Heslington, *Spruce*; Skipwith Common (very red); Market Weighton and Filey, *c. fr.*, *M.*—*B. turbinatum* Schwaegr., Newbald Springs, *R.*—*B. bimum* Schreb., Heslington fields, *Spruce*; Market Weighton, *M.*; in marsh, Naburn (very abundant, and crowded with fruit).—*B. pseudo-triquetrum* Schwaegr., Market Weighton, *M.*; Filey, *M.*; Swinemoor, Beverley, *M.*; Buttercrambe and Garton-in-Holderness, *W.*—*B. intermedium* Brid., Market Weighton, *M.*; Naburn and Driffield.—*B. capillare* L., abundant everywhere; near the var. *rosulatum* (*teste* Dixon), on Filey clay cliffs.—*B. erythrocarpum* Schwaegr. Barmby and Woodhouse Moors, *Spruce*; Market Weighton Common, *M.*; Buttercrambe, *W.*—*B. atropurpureum* W. & M., Langwith Moor, *Spruce*; Londesborough and Goodmanham, *M.*—*B. murale* Wils. (in fine fruit), Goodmanham, 1896, *M.*—*B. argenteum* L., common everywhere; var. *majus* B. & S., approaching this, Driffield; and possibly this, Staddlethorpe (*teste* Dixon).

Mnium rostratum Schrad., woods, *Spruce*; Holme, *P.*; Barmby Moor.—*M. undulatum* L., hedgerows (sterile), *Spruce*; Brough, *P.*; Goodmanham (in fine fruit), *M.*—*M. hornum* L., in all heathy woods.—*M. punctatum* L., bog near Heslington, *Spruce*; Cliff, *P.*; Houghton Wood, *M.*; Barlby and North Grimston; Buttercrambe, *W.*

Fontinalis antipyretica L., Everingham, *M.*; Buttercrambe, *W.*; on logs in pool, Staddlethorpe (of large growth and in fine fruit); Driffield (with dense branches and large leaves); Grimston-in-Holderness, *W.*

Cryphæa heteromalla Mohr., Sledmere and Flamborough, *S.*; Brantingham and Market Weighton, *P.*

Neckera crispa Hedw., Woodale, South Cave, *P.*—*N. complanata* Hübn., woods near York, *Spruce*; Londesborough Park, *c. fr.*, *M.*; Buttercrambe, *W.*

Homalia trichomanoides Brid., woods by Derwent, *Spruce*; Cliff Wood, *P.*

Leucodon sciuroides Schwaegr., Howsham, *S.*; Howden, *P.*; Londesborough Park, *M.*; Grimston-in-Holderness and Sledmere, *W.*

Myrinia pulvinata Schimp., east bank of Ouse near York, *Spruce*.

Antitrichia curtipendula Brid., in a peaty or fossilized condition, attached to the piles of the ancient lake-dwellings at Ulrome, *W. Strickland*.

Leskea polycarpa Ehrh., near Laysike, *S.*; Riccall, *P.*; Naburn (robust); var. *paludosa* (Hedw.) Schimp., Beverley, *T.*; The Pulfin, banks of River Hull, *M.*

Anomodon viticulosus H. & T., Springwells, Goodmanham, *M.*

Thuidium tamariscinum B. & S., North Driffield, *P.*; Houghton

Wood, *c. fr.*, *M.*; Filey.—*T. recognitum* Lind., Market Weighton, *M.*; Sledmere, *W.*; Settrington, *S.*

Climacium dendroides W. & M., bog near Heslington, *Spruce*; Skipwith, *P.*; Goodmanham (in fruit), The Pulfin, River Hull, *M.*

Cylindrothecium concinnum Schimp., Langton Wold, *S.*; Market Weighton, *M.*

Pylaisia polyantha B. & S., near York, *Spruce*; Springwells, Goodmanham, abundant on willows and hawthorn, *M.*

Isothecium myurum Brid., Grimston Cliffs, *W.*; Dane's Dyke, Flamborough; Cliff Wood, *P.*; Beverley Westwood, *M.*

Pleuropus sericeus Dixon, Sledmore, *S.*; Barlby, *P.*; Londesborough Park, *c. fr.*, *M.*; Filey.

Camptothecium lutescens B. & S., Kirkham, *Spruce*; Welton, *P.*; Market Weighton and Brantingham, *M.*; Ganton, *W.*; Filey.

Brachythecium glareosum B. & S., near York, frequent, *Spruce*.—*B. albicans* B. & S., York and Grimston, *Spruce*; Holme, *P.*; Goodmanham, *c. fr.*, *M.*; cliffs at Bridlington, *W.*; Filey, Skipwith Common (the latter bright green, a rare form).—*B. rutabulum* B. & S., very common in many places; var. *longisetum* Brid., near Langton, *S.*; var. *plumulosum* Schimp., wood near Market Weighton, *M.*; var. *robustum* Schimp., in marsh, Naburn.—*B. rivulare* B. & S., Selby, east of Ouse (*teste* Dixon, an abnormal form).—*B. velutinum* B. & S., Filey, Barmby Moor, Lockington, Dane's Dyke, Flamborough. — *B. populeum* B. & S., Kirkham, *Spruce*.—*B. plumosum* B. & S., Garton Cliff, *W.*—*B. cæspitosum* Dixon, York, on tree-trunks by Ouse, *Spruce*; Naburn.—*B. purum* Dixon, Sledmere, *c. fr.*, *S.*; Welton, *P.*; Market Weighton, *c. fr.*, *M.*; Skipwith Common, Filey, North Grimston.

Eurhynchium pilferum B. & F., Firby Wood, Kirkham, *Spruce*; Brantingham, *P.*; Oven Wood, Goodmanham, *M.*—*E. crassinervium* B. & S., Lowthorpe, *S.*; North Grimston (both a large and a small form).—*E. speciosum* Schimp., on wet stones under willows by pool, Staddlethorpe, the habitat now destroyed; abundant (*teste* Dixon).—*E. prælongum* B. & S., Kirkham, Langwith, *Spruce*; Welton and Riccall, *P.*; Market Weighton, *c. fr. M.*; Naburn, Filey, Dane's Dyke, Barlby.—*E. Swartzii* Hobk., Holme and Brough, *P.*; Market Weighton, *M.*; Selby, Southburn, Birdsall, Dane's Dyke, Naburn.—*E. pumilum* Schimp. Beverley Westwood, *M.*; North Grimston, *S.*; Naburn (*teste* Dixon).—*E. Teesdalei* Schimp., Beverley, *T.* (not since confirmed).—*E. tenellum* Milde, Goodmanham Wold, *M.*—*E. myosuroides* Schimp., Firby Wood, *Spruce*; Riccall, *P.*—*E. striatum* B. & S., hedgebanks, *Spruce*; Riccall and Welton, *P.*; Londesborough, *c. fr.*, *M.*; Filey.—*E. rusciforme* Milde, abundant on stones in streams, North Grimston, Filey, Staddlethorpe. — *E. murale* Milde, Risby, *Spruce*; Burythorpe, *S.*; Welton, *P.*; Goodmanham and Londesborough, *M.*; Escrick.—*E. confertum* Milde, Ganton, *W.*; Southburn, Dane's Dyke, Flamborough, Pocklington.

Plagiothecium Borrerianum Spruce, Cliff Wood, *P.*—*P. denticulatum* B. & S., Langwith, &c., *Spruce*; Lund, *P.*; Houghton Wood, &c., *M.*; Barlby; var. *aptychus* L. Cat. ed. 2, Langwith, *W.*—*P. sylvaticum* B. & S., Sledmere, *S.*; Beverley Westwood, *M.*;

Dane's Dyke, Flamborough (with double nerve long and strong).—*P. undulatum* B. & S., Cliff Wood and Holme, *P.*; Elvington, *Spruce*; Houghton Wood, *c. fr.*, *M.*

Amblystegium serpens B. & S., Eddlethorpe, *S.*; Drewton, *P.*; Brantingham, Garton, Kirk Ella, *W.*; Howden, Southburn, Naburn, Barmby Moor, Filey; var. *tenue* Schimp., Dane's Dyke, Flamborough (must be near this var. at least, *teste* Dixon).—*A. Juratzkæ* Schimp., in abundance on wet stones under willows, and on willows, by border of pond, Staddlethorpe, *c. fr.* (*teste* Dixon and Braithwaite), the habitat now destroyed; Dane's Dyke, Flamborough, *c. fr.* (with very long narrow cells like the *A. Juratzkæ* from Coatham Marshes); Birdsall, *S.*—*A. irriguum* B. & S., Kirkham Locks, *Spruce*; Welham, *S.*; in abundance on stones by border of lake, North Grimston.—*A. filicinum* De Not, Kennythorpe Moor, *S.*; Welton, *P.*; Goodmanham, *c. fr.*, *M.*; Garton-in-Holderness, *W.*; Staddlethorpe, Naburn, Filey, Dane's Dyke, Skipwith Common (the last a small form in abundance, and the one mentioned by Wilson as apt to be mistaken for *Hypnum elodes*).—*A. Kochii* B. & S., Driffield, on edge of pool, the large form identical with Sussex specimens, and a small form (*teste* Dixon).

Hypnum riparium L., Heslington Fields, *Spruce*; Brantingham, *P.*; Market Weighton and Pocklington, *M.*; Staddlethorpe, Riccall, Driffield; var. *longifolium* Schimp., Grimston-in-Holderness, *W.*—*H. elodes* Spruce, Barmby Moor and Market Weighton, *M.*; Skipwith Common in abundance.—*H. polygamum* Schimp., bog in Heslington Fields, *Spruce*; in marsh, Naburn, creeping up bulrushes, and covered with fruit; a highly interesting form, being *polyandrous* rather than polygamous, and having some leaves falcate; also easily liable to be mistaken for *H. aduncum* Hedw. (*teste* Bagnall and Dixon); it occurs in great abundance in this small marsh; Skipwith Common and Filey; var. *stagnatum* Wils., Skipwith Common and Naburn.—*H. stellatum* Schreb., Heslington Fields, *Spruce*; Brough, *P.*; Market Weighton, *c. fr.*, *M.*; Buttercrambe, *W.*; Filey, Naburn, and Skipwith Common, the last abundant.—*H. chrysophyllum* Brid., Kirkham, *Spruce*; Kiplingcotes, *S.* and *M.*—*H. Sommerfeltii* Myr., Kirkham Woods and Abbey, *S.*—*H. aduncum* Hedw., Group *typicum* Ren., forma *falcata* Ren., Naburn; forma *lævis* Boul., in ditch by wood, Barlby; var. *diversifolium* Ren., *M.S.*; Selby, in marshy field east of Ouse. Group *Kneiffii* Ren.:—var. *polycarpon*, Bland., abundant in marsh, Naburn, and fruiting in small depression at the foot of a bulrush; a special feature of this var. is the very slight attachment of the seta, so that even in gently washing the moss in water the setæ almost invariably float off:—var. *intermedium* Schimp., in marsh, Naburn. Group *pseudo-fluitans* Sanio:—var. *paternum* Sanio, forma *gracilis* Ren., *M.S.*; in marsh, Naburn.—*H. Sendtneri* Schimp., Newbald and Skipwith, *P.*; Market Weighton, *M.*; Skipwith, in abundance; forma *vulgaris* Sanio, in marshy field, Naburn, growing in large masses.—*H. Wilsoni* Schimp., very fine growth on Skipwith Common.—*H. lycopodioides* Schwaegr., in very great abundance, covering a large tract of marshy ground, and unmixed with other mosses, Skipwith Com-

mon.—*H. fluitans* L., Skipwith Common, *P.*; Market Weighton, *M.*; Langwith, *W.* Group *Amphibium* Ren.:—var. *Jeanbernati* Ren., in vast masses floating in large pond, and drifting to the side, fruiting very sparingly, with seta $4\frac{7}{8}$ inches long, and a very small capsule, not much longer than wide, Skipwith Common; forma *tenella* Ren., Skipwith Common; forma *Holleri* (Sanio) Ren., a moss easily mistaken for *H. riparium*, Skipwith Common; forma *condensata* Sanio, Skipwith Common; the forma *elata* "ad var. *elatum* Ren. & Arnold *transiens*," forming the bed of a large pool, and interwoven with *Sphagnum cuspidatum* var. *submersum* and *Pilularia*, Skipwith Common; var. *gracile* Boul. (a delicate and vivid green moss), Skipwith Common; forma *laxifolia* Ren. (*H. aduncum* var. *pseudo-fontanum* Sanio of *British Moss Flora*), Skipwith Common; near var. *Payoti* Ren., Skipwith Common. Group *falcatum* Ren.:—var. *falcatum* Schimp., Skipwith Common; var. *alpinum* Sanio, Skipwith Common; var. *Arnellii* Sanio, in large masses in the narrow water-channels running into the ponds, Skipwith Common, the habitat being approachable only after very dry weather. Group *exannulatum* Ren.:—var. *pinnatum* Boul. (forma *gracilescens* Ren.), Riccall Common, *W. West*; Skipwith Common; forma *polyclada* Ren., *M.*, *S.*, Skipwith Common; var. *brachydictyon* Ren., abundant on Skipwith Common in several forms, including a very pretty one with short wide leaves. Sub-group *Rotæ* Ren.:—var. *falcifolium* Ren. (var. *stenophyllum* Wilson), Skipwith Common, *I.*, *C. H. Waddell*.—*H. revolvens* Sw., Tilmire and Skipwith Common; var. *Cossoni* Ren., Driffield, a beautifully coloured moss.—*H. intermedium* Lindb., Selby, east of the Ouse (slightly striate, and approaching *H. vernicosum*), and Skipwith Common. — *H. commutatum* Hedw., Drewton, *P.*; near Firby Wood, Kirkham Abbey.—*H. falcatum* Brid., Skipwith Common, Driffield and Naburn (the last a small form and abundant).—*H. cupressiforme* L., widely distributed; var. *resupinatum* Schimp., Kelfield, *P.*; Londesborough Park, *c. fr.*, *M.*; Sledmere, *W.*; Filey Cliffs; var. *ericetorum* B. & S., wood near Market Weighton, *c. fr.*, Holme Wood, *M.*; abundant and in fruit on Riccall and Skipwith Commons; var. *tectorum* Brid., Filey.—*H. imponens* Hedw., Skipwith Common, *P.*, *I.* (always barren), and wood near Market Weighton, *M.* — *H. molluscum* Hedw., woods near the Derwent, *Spruce*; Welton, *P.*; frequent on the wolds, *M.*; Skipwith Common.—*H. palustre* L., Laysike, *S.*; Market Weighton, Beverley, *M.*—*H. scorpioides* L., Riccall Common, *P.*; abundant on Skipwith Common and at Naburn; Buttercrambe, *W.*—*H. stramineum* Dicks., Riccall Common, *P.*; very abundant on Skipwith Common.—*H. cordifolium* Hedw., bog in Heslington Fields, *Spruce*; Beverley, *T.*; Riccall and Skipwith Common, *W.*; exceedingly abundant and crowded with fruit on Skipwith Common, *I.*, *C. H. Waddell*. — *H. giganteum* Schimp., Driffield (with very dense radiating branches), and Skipwith Common.—*H. cuspidatum* L., Filey, Naburn, and Skipwith, abundant and widely spread; Garton-in-Holderness, *W.*—*H. Schreberi* Willd., Langwith Moor, *Spruce*; Holme, *c. fr.*, *P.*; Market Weighton, *c. fr.*, *M.*; Skipwith Common, abundant under heather, and Selby.

Hylocomium splendens B. & S., heaths east of York, *Spruce*; Holme, *c. fr.*, *P.*; Skipwith Common.—*H. squarrosum* B. & S., Welton and Holme, *P.*; Market Weighton, *c. fr.*, *M.*; Garton-in-Holderness, *W.*; Staddlethorpe and Skipwith Common.—*H. triquetrum* B. & S., woods near York, *Spruce*; Holme, *c. fr.*, *P.*; Buttercrambe, *W.*

Hepatics.

Frullania dilatata (L.), on trees, especially in orchards, *Spruce*; Filey, Dane's Dyke, Southburn; Grimston, Brantinghamthorpe, Buttercrambe, *W.*

Radula complanata (L.), on trees, everywhere, *Spruce*; Sledmere, *W.*; Lockington (with abundant capsules), and Dane's Dyke, Flamborough; Brantinghamthorpe, *W.*

Blepharozia ciliaris (L.), Langwith Moor, *Spruce*; Houghton Moor, *c. fr.*, *T.*; Skipwith Common, *P.*, *W.*, in large masses under heather; Barmby Moor; Sledmere, *S.*

Lepidozia reptans (L,), heathy woods by the Derwent, *Spruce*.—*L. setacea* (Web.), Langwith and Barmby Moors, *Spruce*; Skipwith Common, *W.*

Kantia trichomanis (L.), heathy banks near York, *Spruce;* Langwith, Buttercrambe, *W.*; Barmby Moor, Skipwith Common.—*K. Sprengelii* (Mart.), Skipwith Common.

Cephalozia lunulæfolia Dum., Houghton Moor, *T.*; heaths, creeping on *Sphagnum*, Langwith, &c., *Spruce*; Holme Wood, *M.*—*C. bicuspidata* (L.), moist shady places everywhere, *Spruce*; Langwith, Skipwith, *W.*—*C. Lammersiana* (Hüben.), Barmby Moor, Skipwith Common; Barmby Moor, *M.* — *C. connivens* (Dicks.), Skipwith Common, in masses on peaty soil; near Market Weighton and Holme Wood, *M.*—*C. Francisci* (Hook.), Langwith and Barmby Moors (in fruit, which is very rare), *Spruce*.

Odontoschisma Sphagni (Dicks.), Barmby and other moors, *Spruce*.—*O. denudata* (Mart.), Barmby Moor, *M.*

Cephaloziella divaricata (Sm.), moors and moist shady banks near York, *Spruce*; Houghton Wood, Market Weighton, *S.*; Barmby Moor.—*C. stellulifera* Tayl., on dead sticks and leaves, with abundant capsules and perianths, Barmby Moor (*teste* Pearson).—*C. dentata* (Raddi), very probably this, but too young to be certain, on bare peaty ground, Skipwith Common.

Diplophyllum albicans (L.), banks everywhere, *Spruce*; Langwith, Filey, *W.*—*D. obtusifolium* (Hook.), Langwith Moor (in fruit), *Spruce*; var. *elegantula* Spruce, foliis spinuloso-dentatis, areolatione guttulata, Langwith Moor, *Spruce*.

Lophocolea bidentata (L.), shady banks near York and elsewhere, *Spruce*; Naburn (tall marsh form), Dane's Dyke, Southburn, Skipwith Common.—*L. cuspidata* Limpr., Barmby Moor.—*L. heterophylla* (Schrad.), decaying tree-stumps in Sledmere, fruiting abundantly, *S.*; near Beverley, *J. L. Cocks*; North Grimston, in abundant fruit.

Scapania resupinata (L.), woods near the Derwent, *Spruce*.—*S. irrigua* (Nees), on damp side of path, Skipwith Common.

Chiloscyphus polyanthos (L.), Skipwith Common, *P.*, and Skipwith, floating in large pond, with very long stems.

Mylia Taylori (Hook.), Langwith and Barmby Moors, *Spruce*.—*M. anomala* (Hook.), Skipwith Common.

Plagiochila asplenioides (L.), woods by the Ouse and Derwent, *Spruce*; Welton Dale, *P.*; Dane's Dyke.

Jungermania riparia Tayl., near Market Weighton, *M.*—*J. inflata* Huds., on all wet moors, mostly sterile, but fruiting on Langwith Moor, *Spruce*, and Skipwith Common, *P.*—*J. turbinata* Raddi, Settrington, *S.*; Filey and Market Weighton, *M.*—*J. exsecta* Schmid., and *J. incisa* Schrad., Langwith Moor, *Spruce*.—*J. capitata* Hook., and *J. bicrenata* Schmid., Langwith Moor (in fruit), *Spruce*. *J. ventricosa* Dicks., Langwith and other moors, *Spruce*; Beverley, *T.*; Barmby Moor, with long stems and lax leaves, creeping over dead sticks.—*J. crenulata* Sm., Skipwith Common; near Market Weighton, *M.*

Nardia scalaris (Schrad.), sandy and heathy situations around York, *Spruce*; Skipwith Common, abundant on sides of sandy cuttings.

Marsupella emarginata Ehrh., Holme Wood, *M.*

Fossombronia Dumortieri Lindb., Barmby Moor, *Spruce*; Skipwith Common, with abundant capsules, on bed of dried-up ditch.—*F. cristata* Lindb., Beverley, *M.*; Langwith Moor, in stubble-field, in fine fruit (*teste* Macvicar).

Scalia Hookeri (Lyell), Barmby Moor (in fruit), very rare, 5 Nov., 1842, *Spruce*.

Blasia pusilla (L.), Filey.

Pellia epiphylla (L.), shady ditch-banks everywhere, *Spruce*.—*P. calycina* Tayl., banks of Derwent, *Spruce*.

Aneura multifida (L.), wet banks and rotting wood, York, &c. *Spruce*; Kelfield, *P.*—*A. latifrons* Lindb., Filey (*teste* Macvicar).—*A. pinguis* (L.), banks of Ouse and Derwent, margins of brick-ponds, &c., *Spruce*.

Mentzgeria furcata (L.), common on trees, *Spruce*; Dane's Dyke; North Grimston, *S.*

Marchantia polymorpha L., common in shady places, especially on burnt earth and charred wood, *Spruce*.

Conocephalus conicus L., near York, under bridges, at the mouth of wells, &c., *Spruce*; Buttercrambe, *W.*; Dane's Dyke.

Reboulia hemisphærica (L.), Firby Wood, on stones, *Spruce*.

Lunularia cruciata (L.), on garden-paths, &c., near York, *Spruce*.

Sphærocarpus terrestris (Mich.), Beverley, in fallow fields, *T.*

Riccia glauca L., Riccall, *P.*; near Rudstone, *W.*; Langwith Moor, in stubble field, abundant, associated with *Fossombronia cristata*.

Ricciella fluitans (L.), ditches and ponds near Beverley, *T.*; Buttercrambe, Grimston, *W.*

Ricciocarpus natans (L.), ditches and ponds near Beverley, *T.*; var. *terrestris*, side of pond, east of Ouse, Selby.

CERCOSPORITES SP., A NEW FOSSIL FUNGUS.

By Ernest S. Salmon, F.L.S.

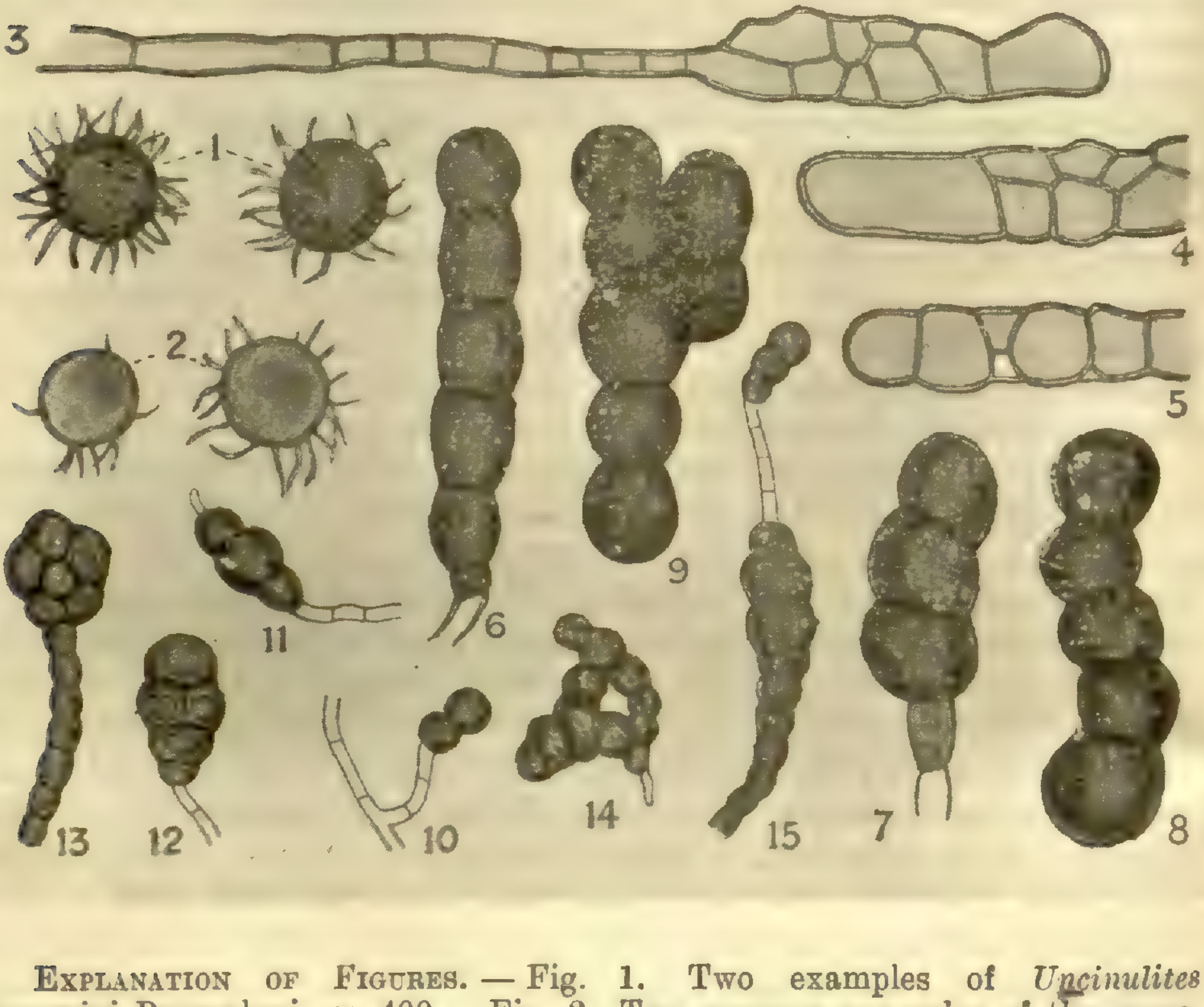
In a recent paper entitled "Microflora e Microfauna nel disodile di Melilli in Sicilia" (Rendiconti della R. Accad. dei Lincei, vol. xi. 2 sem. 250, 251 (1902)) Dr. Pampaloni has described two organisms occurring in these "disodile" beds—a tertiary deposit belonging in all probability to the Middle Miocene—as fungi belonging to the *Erysiphaceæ*. Two genera are described, *Uncinulites*, with the single species *U. Baccarini*, and *Erysiphites*, with the species *E. Melilli*. As I have for some years studied the *Erysiphaceæ*, I was anxious to see, if possible, the fossil remains which have been referred to this family. I have to thank Dr. Pampaloni for his courtesy in allowing me to examine the two slides of the preparations of these organisms, and also for permission to publish the following observations on another fungus found in one of the preparations.

Erysiphites Melilli is described as follows:—"Perithecia sparsa, superficialia, sphæroidea, undique clausa, atra, ceraceo-membranacea, 170 μ, mycelio arachnoideo, persistente, appendicibus ramosis, flexuosis, sordide luteis, numerosis." The type-slide sent to me contains one example of the organism described above. This single example consists of a globose body, the diameter of which measures 180 μ. From the periphery of this body, which is of a dark brownish colour, numerous pale brown septate threads radiate. These threads are 2–3 μ in diameter, and have all the appearance of mycelial hyphæ. But there are, I think, reasons to doubt if the central body is a perithecium. In examining the specimen with a high objective, a slight pressure on the cover-glass caused the globular body to begin to separate along several lines. Neither after this occurrence—as well as before it—could any cellular structure be observed in the "perithecium," and in my opinion the central globular body consists of but a single cell. Further, the bounding membrane of this cell seems to me to resemble that found in animal rather than in vegetable structures. In the same slide, it may be noted, three other globular bodies occur, of the same colour and of about the same size as that described above. These three bodies are all quite naked, being without any trace of fungal hyphæ. One of them, except in this absence of the peripheral hyphæ, resembles so closely the individual first described above that it must, I think, be regarded as being of the same origin. The two other bodies show a more transparent and apparently chitinous membrane, and resemble closely the eggs of a mite, or some such animal. It is quite possible that the single example first described above may be of similar origin, and that the investing fungal hyphæ are extraneous. Whatever be the correct interpretation of these bodies, *i. e.* whether they are of animal or vegetable origin, they cannot, I consider, be regarded as perithecia, and have therefore nothing to do with the *Erysiphaceæ*.

Uncinulites Baccarini is described as follows:—"Perithecia subglobosa, tenui membranacea, nigra, astoma, 30–35 μ, appendicibus

18–25 simplicibus apice uncinatis perithecium fere æquantibus, indivisis, ad apicem fuscis ad basim atris.''*

The type-slide of the above is of extreme interest, since it contains a number of well-preserved fungus spores and fragments of



Explanation of Figures. — Fig. 1. Two examples of *Uncinulites Baccarini* Pampaloni, × 400. Fig. 2. Two younger examples of the same, more transparent, and showing that each individual consists of a single cell, × 400. Fig. 3. Mycelial hypha giving rise to a plate-like expansion × 400. Figs. 4, 5. Portions of similar expansions × 400. Figs. 6–9. *Circosporites* sp. 6, 7. Mycelial hyphæ giving rise to chains of enlarged subglobose cells, which probably function as sclerotia × 400; 8, 9, loose clusters of similar cells × 400. Figs. 10–15. *Cercospora acerina* Hartig; groups of "Dauermycel" × 220 (from Hartig, *l. c.* Zaf. iv, fig. 6).

mycelium. First, as regards the objects called "*Uncinulites.*" These are small globose bodies measuring 20–22 μ in diam., covered, when ripe, on the outside with straight or curved filiform or spine-like projections—the so-called "appendages"—which attain sometimes to half the diameter of the globose body (figs. 1, 2). Both the central globose body and the projections are brownish in colour. These globose bodies, which are termed "perithecia" by Pampaloni in the diagnosis given above, are in the majority of instances so darkly coloured as to be rendered opaque (fig. 1); in a few cases, however, individuals—evidently in

* This is an emended description sent to me by Dr. Pampaloni; in the original the words, through an error, run "appendicibus simplicibus, 18–25 cm. longis."

a younger stage of development, as is shown by the almost complete absence of projections—occur which are more transparent, and in these, under a high power with a strong illumination, it can be seen that each globose body is not a compound mass of cells, but a *single cell* (fig. 2). It seems clear, therefore, that each is to be regarded, not as a perithecium with appendages, but as a single spore with a spinous epispore. On the precise determination of these spores I am not able at present to throw any light. It may be pointed out further that neither in the small size of the supposed "perithecium" nor in the nature of the "appendages" do the present objects bear the slightest resemblance to any of the species of the genus *Uncinula* of the *Erysiphaceæ* (cfr. Salmon, Monogr. of the *Erysiphaceæ* (Mem. Torr. Bot. Club, ix. 79–120 (1900)); and "Supplementary Notes, &c." (Bull. Torr. Club, xxix. 96–103 (1902)).

In the same mount with the "*Uncinulites*" fragments of mycelium and chains of globose spore-like bodies occur. These mycelial hyphæ are 5–8 μ in diam., and rather closely septate. They can be seen clearly giving rise to rows of enlarged more or less globose cells, which are at first somewhat hyaline (so that the wall of each cell is apparent), but which become finally more or less opaque. The enlarged cells measure from 15 to 23 μ in diam., and sometimes occur clustered, as shown at fig. 9. In the same slide similar hyphæ are found which give rise to expansions two cells wide in places (figs. 3, 4, 5). It is possible that these are the early stages in the formation of the clustered enlarged cells (cfr. figs. 3, 4, 5, and 9).

These hyphæ agree in the production of enlarged opaque spore-like cells so closely with those of *Cercospora acerina*, described by Hartig (Untersuch. aus dem forstbot. Institut zu München, 1, 60 (1880)) that the present fungus may safely, I think, be referred to this genus. Hartig (l.c.) thus describes this stage of development in *C. acerina*:—"Nachdem die Conidienbildung beendet ist, sieht man das Mycel hier und da anschwellen und eine zunächst bräunliche Färbung annehmen. Die Umwandlung des Mycels zu einem fädigen Dauermycel, zu der einfachsten Form der Sclerotien, schreitet fort, bis die ganze Blattsubstanz von zahlreichen Ketten und Gruppen desselben durchzogen ist. Die Zellen des Mycels schwellen bei dieser Umwandlung zunächst an. Es finden weitere Zelltheilungen theils parallel den ursprünglichen Scheidewänden, theils rechtwinklig zu diesen statt, so dass zuweilen complicirte Gewebekörper entstehen. Im Allgemeinen bleiben aber diese Dauerzustände einreihig und es sind immer nur kleinere oder grössere Gruppen von Zellen, welche die Umwandlung erleiden, während die sie verbindenden an der Umwandlung nicht theilnehmen, später absterben und aufgelöst werden." The figures given by Hartig (*l.c.* Taf. iv.) of the enlarged cells, which function as sclerotia of the mycelial hyphæ of *Cercospora acerina*, agree closely with those drawn from the fossil examples occurring in the slide sent by Dr. Pampaloni, as may be seen by comparing figs. 6–9 with figs. 10–15.

I wish to express my obligation to Mr. George Massee, F.L.S., for having directed my attention to Hartig's figures.

The following diagnosis may be given of this fossil fungus :— CERCOSPORITES sp. Hyphæ myceliares filamentosæ singulatim repentes dilute brunneæ septatæ 5–8 μ diam. hinc inde in cellulas magnas 15–23 μ diam. maturitate opacas atro-brunneas plus minus globosas 3–6-catenulatas vel raro biseriatim aggregatas probabiliter pro sclerotiis habendas subito inflatæ.

KENT RUBI.

By E. F. LINTON, M.A.

THE notes which follow record the Brambles observed by Dr. D. T. Playfair and myself, including some detected by Dr. Playfair alone, in July, 1901. All have been submitted to the Rev. W. M. Rogers, F.L.S.

The localities are mostly additional to the *Flora of Kent*; they are all within about three miles of Bromley, and therefore in District 1, to which some (marked *) are apparently new. None are new to the county, unless one excepts *R. Gelertii*, of which, however, the variety *criniger* Linton has been recorded by Mr. Rogers for District 8 (and see p. 93).

Rubus Rogersii Linton. Farnborough Common; and also, I think, Hayes Common, the only locality in the county previously recorded, but we failed to take specimens hence.

R. carpinifolius W. & N. Bromley Hill Woods.

R. pulcherrimus Neuman. Farnborough and Hayes Commons.

**R. Selmeri* Lindeb. Keston Common and Hayes West Hill.

**R. argentatus* P. J. Muell. forma. Barnet Wood.

R. Sprengelii Weihe. Barnet Wood and Farnborough Common.

**R. micans* Gren. & Godr. Keston Common.

**R. Gelertii* Friderichsen. Farnborough Common.

**R. infestus* Weihe. A very strong form. Hayes Common. Farnborough Common.

R. Babingtonii Bell Salter. Bromley Hill Wood and Farnborough Common.

**R. scaber* W. & N. Hayes Common and wooded roadside on the way there from Bromley.

R. pallidus W. & N. var. **leptopetalus* Rogers. On a bank in private grounds near Bromley Hill Wood ("apparently *leptopetalus*," W. M. R.). Farnborough Common. The former looked to me like ordinary *R. pallidus* W. & N., and I recognized it at once. The latter plant, with neater and smaller habit, narrower leaves and petals, seemed a new form to me, and I owe the name to Mr. Rogers, who recognized it as exactly his variety; not given in the *Flora of Kent*, but noticed by the Rev. W. M. Rogers, pp. 94, 95.

R. foliosus W. & N. Westmorland Road, Bromley, and Keston Common.

R. rosaceus W. & N. var. *infecundus* Rogers. Barnet Wood. Bromley Hill Wood. Keston Common.

R. adornatus P. J. Mueller. Keston and Hayes Commons.

R. Koehleri W. & N. form? Hayes Common. This requires further study. Mr. Rogers's comment was "very different from all Koehlerians known to me."

R. dumetorum W. & N. Hedges near Bromley. To my eye an ordinary *dumetorum* form, not very pronounced. Mr. Rogers agrees and does not give any varietal name.

I have not thought it worth while placing *R. rusticanus*, *R. leucostachys*, or one or two corylifolian forms. One of the latter appeared to me to be var. *cyclophyllus* Lindeb. Mr. Rogers thought it too glandular. An interesting plant from Keston Common remains unnamed, apparently one of the *R. hirtus* group.

ALABASTRA DIVERSA.—Part X.

By Spencer Le M. Moore, B.Sc., F.L.S.

(Continued from p. 102.)

Dr. Rand's Johannesburg Compositæ.

Already well known for his botanical discoveries in Rhodesia, Dr. R. F. Rand is now seeking fresh laurels, this time in the Transvaal. He has sent to the British Museum a collection recently made in the neighbourhood of Johannesburg, and in accordance with the wise policy prevailing at the Museum of encouraging collectors by early publication, the *Compositæ* of this collection are here given:—

Vernonia Kraussii Sch. Bip. No. 891.

V. natalensis Sch. Bip. No. 890.

V. Sutherlandi Harv. Nos. 735, 737.

Diplopappus filifolius DC. No. 754.

D. asper DC. No. 748.

Marsea podocephala (*Conyza podocephala* DC.). No. 1027. The peduncles are short for the species, not above five centimetres long.

Nidorella resedifolia DC. No. 1025.

N. hottentotica DC. Nos. 762, 980.

Leptothamnus rarifolius Turcz. No. 766.

Denekia capensis DC. No. 739. A form approaching *D. glabrata* DC.

Brachylæna rotundata, sp. nov. Verisimiliter fruticosa, caule folioso leviter striato albide sericeo-tomentoso, foliis breviter petiolatis ovato-oblongis obtusis basi subrotundatis marginibus undulatis supra breviter araneoso-pubescentibus demum fere glabris subtus dense sericeo-tomentosis, capitulis fem. solummodo notis plurifloseulosis in paniculas angustas folia subæquantes digestis, pedunculis propriis brevibus bracteis confertis parvis involucri phyllis extimis similibus nisi minoribus obductis, involucri anguste obovoidei phyllis 5-seriatis extimis abbreviatis oblongo-ovatis obtusissimis interioribus gradatim longioribus oblongis obtusis omnibus araneoso-pubescentibus et apicibus purpurascentibus, corollæ

lobis anguste lineari-lanceolatis, stylo breviter exserto, achæniis cylindricis angulatis sericeo-pubescentibus, pappi setis achænia longe excedentibus sordide albis scabridis.

Hab. Northern escarpment of Witwatersrand series. No. 738. (Also Johannesburg; *Wood*, No. 5333 in Herb. Kew.)

Folia 6·0–8·0 cm. long., 3·0–4·0 cm. lat., paullulum supra basin 2·0–2·5 cm. lat.; supra rubescentia, subtus eminenter nervosa; petioli 0·5 cm. long. Paniculæ adusque 6·0 cm. long., 3·5 cm. diam. Pedunculi proprii circa 0·3 cm. long.; horum bracteæ circa 0·1 cm. long. Involucri phylla extima 0·2 cm., intermedia 0·5 cm., intima vix 0·55 cm. long. Corollæ 0·5 cm. long.; lobi 0·1 cm. long. Achænia 0·22 cm. et pappus 0·6 cm. long.

Differs from *B. discolor* DC. in the undulate leaves *rounded at the base*, a character, moreover, by which it can be told from all other species. Its involucre is different in several respects from that of *B. discolor*, and the female florets have broader corollas with longer lobes. The achenes, also, are broader and shorter.

Helichrysum metalasioides DC. No. 745.
H. obvallatum DC. Nos. 743, 744.
H. fulgidum Willd. var. *monocephalum* DC. No. 741.
H. latifolium Less. No. 767.
H. oreophilum Klatt. No. 892.
H. allioides Less. No. 1024.
H. aureo-nitens Sch. Bip. No. 742.

Helichrysum (Lepicline § Graminacea *) **Randii**, sp. nov. Suffrutex parvus rhizomate crasso dense foliato ramos ascendentes affatim foliosos monocephalos dense araneoso-tomentosos gignante, foliis rhizomaticis sessilibus graminaceis anguste linearibus acutis subcoriaceis supra mox præter pilos breves pellucide glandulosos glabris subtus eminenter 3-nervibus nervis appresse sericeis, foliis caulinis rhizomaticis similibus nisi insigniter brevioribus et lineari-lanceolatis et breviter amplexicaulibus, capitulis mediocribus hemisphæricis multifloseulosis, involucri circa 12-serialis phyllis ovato-oblongis obtusis vel obtuse acutis exterioribus quam intermedia brevioribus paucis intimis anguste spathulato-oblongis haud radiantibus albis vel dilute stramineis, receptaculi fimbrillis ovaria nequaquam superantibus, flosculis omnibus hermaphroditis, antherarum caudis simplicibus, styli ramis apice subcapitatis, achæniis crudis compressiusculis pubescentibus pappi setis scabridis albis.

Hab. Rocky gorge in the neighbourhood of Johannesburg. No. 889. Pretoria; *Rehmann*, No. 4722. (Also, at Kew, Basutoland; *Cooper*, No. 803. Drakensberg; *Wood*, 3501 and 3606, and *Evans*, No. 666. Barberton; *Galpin*, No. 1117.)

Caules fertiles usque ad 13·0 cm. alt., sæpe vero breviores. Folia rhizomatica 5·0–6·0 cm. long., 0·25 cm. lat.; caulina 1·5–2·0 cm. long., basin versus 0·3 cm. lat. Involucrum 1·2 cm. long., 1·4 cm. lat.; phylla extima 0·5 cm., intermedia 0·9 cm. long. et

* Sect. nov.—Suffruticosa. Folia inferiora elongata, omnia subtus paucinervia. Capitula mediocria, solitaria. Involucri phylla haud radiantia, alba vel dilute straminea.

0·33 cm. lat.; phylla intima ± 0·1 cm. lat. Corollæ 5-dentatæ, 1·0 cm. long. Achænia cruda vix 0·1 cm. pappi setæ 0·6 cm. long.

A plant with much of the look of *H. chionosphærum* DC., but different from it, besides the subgeneric characters, in its grass-like leaves, solitary heads with non-radiating involucral leaves, &c.

Seriphium cinereum Linn. No. 818.
Athrixia elata Sond. Nos. 759, 760.
Callilepis leptophylla Harv. No. 761.

Pentzia athanasioides, sp. nov. Suffrutex ramulis ultimis exemptis glaber, caule robusto ramoso abundanter folioso, ramulis erectis araneoso-pubescentibus, foliis sessilibus linearibus adusque medium vel minus alte trilobis rarius bilobis summis integris lobis carnosulis glandulis immersis subsparsim indutis in sicco aliquantulum rugulosis, capitulis pro genere majusculis homogamis multiflosculosis in corymbos breves terminales folia breviter excedentes digestis, involucri subhemisphærici phyllis circa 7-serialibus lanceolatis intimis anguste lanceolato-oblongis omnibus lamina parva acuta scariosa coronatis marginibus anguste scariosis et microscopice ciliolatis dorso glandulosis, receptaculo elevato alveolato, corollis compressiusculis tubo sursum gradatim amplificato deorsum glanduloso-pubescente limbo 5-fido, achæniis adhuc crudis cylindricis 5-costatis puberulis, pappi obscuri lobis minutissimis.

Hab. Rocky places near Hospital Hill, Johannesburg. No. 758.

Folia in toto 1·5–2·0 cm. long., deorsum 0·1–0·15 cm. lat.; lobi 0·5–1·0 cm. long., circa 0·1 cm. lat. Corymbus adusque 3·0 cm. long., bis tanto diam. Involucrum 0·8 cm. long. et totidem diam.; phylla extima 0·35 cm., intermedia 0·5 cm., intima 0·6 cm. long. Receptaculum circiter 0·2 cm. alt. Corollæ 0·3 cm., achænia 0·2 cm. long.

A remarkable species with the look of an *Athanasia*, and elevated receptacle of a *Matricaria*. It perhaps comes nearest *P. pinnatifida* Oliv., but the leaves, involucres, and corollas of the two are altogether different.

Lopholæna Randii, sp. nov. Suffrutex glaber, ramis ramulisque affatim foliosis sat validis angulatis, foliis parvis oblongo-oblanceolatis obtusissimis in caulem decurrentibus basi trinervibus subcarnosulis marginibus cartilagineis, capitulis mediocribus ad apicem ramulorum solitariis circa 18-flosculosis, pedunculis sub capitulo bracteis paucis parvis foliaceis decurrentibus mox decoloribus onustis, involucri subcylindrici phyllis 5 cito solutis ovato-oblongis obtusis dorso leviter carinatis planisve marginibus anguste vel late scariosis, antheris basi minutissime auriculatis, achæniis subcylindricis compressiusculis circa 12-striatis albo-hirsutulis, pappo pluriseriato sericeo setis scabriusculis.

Hab. Rocky places in the neighbourhood of Johannesburg. No. 746.

Folia 2·0–2·5 cm. long., 1·0–1·5 cm. lat., in sicco pallide viridia, glandulis pellucidis abunde onusta. Pedunculorum bracteæ ovatæ vel oblongæ, circa 1·0 cm. long. Involucrum primo 1·2 cm. long., 0·7 cm. lat., sub fructu 1·5 cm. long.; phylla inter se inæquilata,

nunc 0·6 cm. nunc 0·8 cm. lat., horum margo integer vel sursum microscopice denticulatus, apice leviter erosulus. Corollæ in toto 1·5 cm. long.; tubus deorsum induratus; lobi 0·12 cm. long. Styli rami (appendice dorso hirtella inclusa) 0·35 cm. long. Achænia 0·6–0·7 cm. et pappus 1·5 cm. long.

This interesting addition to a genus of very few species has much the appearance of *Othonna coriifolia* Sond., which is, however, a true *Othonna*. It can be told on sight from *L. Dregeana* DC. by its involucral leaves having at most only a shallow keel running down the back instead of a broad crest. Curiously enough, Bentham (Gen. Pl. ii. p. 441) gives this dorsal crest as a character of the genus, whereas his own previously described species (*L. platyphylla*, Ic. Pl. t. 1113) has involucral leaves without even a keel.

The genus includes as its fourth known species the plant described by N. E. Brown as *Othonna disticha* (Kew. Bull. 1895, p. 16). In my opinion *Lopholæna* should be kept distinct from *Othonna*, which has sterile inner florets with undivided style-arms, and fertile outer florets with the truncate and penicillate style-arms of *Senecio*, while all the florets of *Lopholæna* have divided style-arms with an appendage hairy at the back. True, I have myself described as an *Othonna* (*O. ambifaria*) a plant with divided style-arms all through the capitulum; but I now see this to have been a mistake, due to attaching too much importance to the complete separation of the involucral leaves as a character of *Senecio*, whereas in that genus the separation may be deferred until late in the history of the capitulum. *Othonna ambifaria* must therefore be called *Senecio ambifarius*.

Some of the apparently mature achenes of *L. Randii* are much slenderer than others, and would probably not germinate. This is also the case with *L. platyphylla*.

Senecio erubescens Ait. var. Nos. 764, 765.
S. lasiorhizus DC. No. 763.
S. albanensis DC. var. *angustifolius* Harv. No. 888.

Senecio metallicorum, sp. nov. Herbacea, elata, maxima pro parte glabra, caule ascendente valido in longitudinem prominenter striato fistuloso, foliis radicalibus ——, caulinis linearioblongis obtusis obtusissimisve ima basi aliquantulum dilatatis amplexicaulibus margine præsertim prope basin calloso-denticulatis undulatisve uninervibus membranaceis, capitulis parvis discoideis homogamis circa 70-flosculosis in corymbo terminali sparsim bracteato minute glanduloso-pubescente folia excedente dispositis, pedunculis propriis involucro subæquilongis vel brevioribus sub capitulo dilatatis, involucri calyculati campanulati scabriusculi phyllis circiter 20 uniseriatis linearibus seu angustissime linearilanceolatis marginibus membranaceis apice breviter sphacelatis, calyculi phyllis paucis (circa 5–7) subulatis quam involucrum multo brevioribus, receptaculo plano foveolato, corollis verisimiliter dilute flavis involucrum paullulum superantibus sursum tubuloso-campanulatis, antheris basi integris apice appendice brevi spathulata purpurea indutis, styli ramis truncatis penicillatis superne purpureis,

achæniis nondum maturis angustis compressiusculis 10-costatis inter costas puberulis, pappi setis integris albis.

Hab. Banks of streams to northward of Johannesburg. No. 979.

Tota planta saltem $\frac{3}{5}$-metralis. Caulis 0·5 cm. diam. Folia inferiora 10·0–13·0 cm. long., plerumque circa 1·0 cm. lat.; superiora adusque 7·0 cm. imminuta. Corymbus circa 15·0 cm. long., et 6·0 cm. diam. Bracteæ 0·5–1·5 cm. long., lineari-lanceolatæ. Pedunculi proprii modici 0·3–0·5 cm. long. Involucrum 0·7 cm. long., calyculi phylla circa 0·3 cm. Corollæ 0·7 cm. long.; harum lobi 0·1 cm. Achænia 0·3 cm. pappus 0·5 cm. long.; illa 0·05 cm. lat.

To be inserted in the genus next *S. crenulatus* DC., its chief differences residing in the leaves and in the narrow nearly glabrous (instead of densely silky) achenes.

S. othonnæflorus DC. No. 977.

S. orbicularis Sond. No. 768, Very small-leaved form; leaves little more than 1 cm. in diameter.

S. venosus Harv. No. 978.

Euryops multinervis N. E. Br. mss. in Herb. Kew. Breviter caulescens, glaber, foliis confertis caulem sparsim ramosum omnino occludentibus sessilibus circuitu ovato-lanceolatis rigide spinoso-cartilagineo-pinnatifidis dorso costis maxime conspicuis arcte approximatis cartilagineis circa 10 percursis, pedunculis paucis gracilibus caulem longe excedentibus, capitulis parvis multifloscu-losis, involucri hemisphærici fere adusque $\frac{1}{2}$-partiti phyllis circa 12 ovatis obtusis trinervibus apice dilute purpureis et breviter lanatis, ligulis circa 12 involucrum breviter superantibus oblongis obscure tridentatis, styli ramis complanatis truncatis penicillatis, achæniis crudis lineari-oblongis puberulis, pappi setis quam corolla multo brevioribus debilibus intertextis scabridis albis.

Hab. Open veldt around Johannesburg. No. 747. (Also Middelburg; *Bolus*, No. 7610 in Herb. Kew.)

Caulis circa 3·0 cm. alt., 0·2 cm. diam. Folia in sicco sub-glaucescentia, 0·8–1·0 cm. long.; lobi utrinque 6, circa 0·1 cm. long., 0·02 cm. lat. Pedunculi 10·0–13·0 cm. long. Involucrum 0·45 cm. long., circa 1·0 cm. lat.; lobi circa 0·2 cm. long. Ligu-larum limbi 0·35 cm. long., pæne 0·2 cm. lat. Corollæ campanu-latæ, in toto 0·3 cm. long. Styli rami 0·04 cm. long. Achænia immatura 0·12 cm. long., margine brevissime alata, circa 10-sulcata. Pappus 0·1–0·13 cm. long.

Nearest *E. setiloba* N. E. Br., from which it can be at once distinguished by its strongly nerved leaves, broader in the shaft and much shorter in the lobes.

Wilms's plant, No. 749, from the Ermelo district, distributed as an *Oligothrix*, would appear to be the same as the one here described. Dr. Rand notes, "Some specimens would appear to be rayless."

Gamolepis laxa Harv. No. 752.

Othonna natalensis Sch. Bip. Nos. 750, 983.

O. scapigera Harv. No. 751.

Dimorphotheca Barberiæ Harv. Nos. 749, 981, 982.

Ursinea annua Less. var. No. 755.

Crocodilodes seminivea (*Berkheya seminivea* Harv. & Sond.). No. 895.

C. subulata (*Berkheya subulata* Harv.). No. 976.
Haplocarpha scaposa Harv. No. 893.
Meridiana Krebsiana O. Kuntze (*Gazania Krebsiana* Less.). Nos. 756, 757.
Perdicium piloselloides Hiern (*Gerbera piloselloides* Cass.). No. 894.
P. discolor (*Gerbera discolor* Sond.). Nos. 769, 771.
Crepis polyodon Bolus. No. 763.
Lactuca capensis Thbg. No. 764.

NEW SPECIES COLLECTED BY CAPT. BARRETT-HAMILTON.

Before leaving for home, Capt. Barrett-Hamilton, already known for his consignments of plants from the north-east part of the Orange River Colony, took the opportunity of a visit to the Western Transvaal and Griqualand West to gather specimens for the Museum. Of these several prove to be new species, and three are described below :—

Osteospermum Hamiltoni, sp. nov. Suffrutex humilis, ramulis verisimiliter procumbentibus vel saltem patentissimis abunde foliosis, foliis parvis sessilibus ambitu oblongis pinnatifidis utrinque 4–5-jugis (jugis 1–2 cauli approximatis) summis nonnunquam integris vel subintegris lobis linearibus acutis lamina una cum ramulis pilis perbrevibus glandulosis conspersa, capitulis parvulis circa 11-flosculosis, involucri campanulati phyllis subbiserialibus circa 7 anguste lineari-lanceolatis acutis marginibus membranaceis ciliolatis dorso breviter glandulosis, receptaculo plano nudo, ligulis 7–8 oblongis apice obscure 3-denticulatis, achæniis subteretibus omnimodo alte rugatis vel verrucosis glandulosis.

Hab. Griqualand West, between Fourteen Streams Station and Schmidt's Drift. (Also Griqualand West; *Mrs. Barber* in Herb. Kew.)

Folia 0·5–0·8 cm. long., 0·4 cm. lat. ; lobi modice 0·2 cm. long., 0·1 cm. lat. Involucri phylla 0·4 cm. long., 0·1 cm. lat. Ligulæ 0·3 cm. long. Floscc. sterilium corollæ 0·2 cm. long. Achænia ægre 0·5 cm. long., 0·2 cm. diam., læte brunneæ, verrucæ fere 0·1 cm. alt.

"A strongly scented plant," according to Mrs. Barber.

Differs from *O. muricatum* E. Mey. in its small leaves, few-flowered heads, smaller more deeply rugulose glandular achenes, &c.

Platycarpha parvifolia, sp. nov. Subacaulis caule simplici vel semel diviso robusto dense albo-lanato, foliis parvis linearioblanceolatis obtusis integris vel summum aliquantulum denticulatis supra viridibus glandulis immersis affatim indutis subtus albolanatis subcoriaceis basi in vaginam latam comparate longam decolorem tenuiter membranaceam 5–7-nervosam dilatatis foliorum ultimorum lamina imminuta nec quam vagina longiore, capitulis more generis ad apicem caulis arcte confertis 6-flosculosis, involucri subcylindrici phyllis 3-serialibus oblongis vel oblongo-lanceolatis intimis anguste linearibus in receptaculi paleas transeuntibus omnibus apice summum breviter spinuloso-acuminatis, receptaculi paleis anguste linearibus involucri phyllis æquilongis, corollis involucrum bene superantibus, antherarum loculis breviter caudatis, styli ramis

lineari-subulatis minute papillosis, achæniis immaturis compressiusculis basi pilosis, pappi paleis 12 lanceolatis vel lanceolato-linearibus minute denticulatis.

Hab. Wolmaransstad district, Western Transvaal.

Folia modica modo (vagina exempta) circa 1·5 cm. long. et 0·4–0·5 cm. lat.; vagina 0·6 cm. long., 0·7 cm. lat.; foliorum summorum lamina usque ad 0·4–0·5 cm. imminuta. Involucrum 0·7 cm. long., 0·5 cm. diam.; phylla 0·7 cm. long., latiora 0·15 cm. angustiora 0·1 cm. lat. Receptaculi paleæ 0·03 cm. lat. Corollæ 0·8 cm. long.; tubus sursum gradatim dilatatus, extus papillosus, inferne 0·04 cm. faucibus 0·12 cm. diam.; lobi 0·3 cm. long. Styli rami 0·1 cm. long. Achænia 0·2 cm., pappi paleæ 0·22–0·25 cm. long., hæ dilute stramineæ.

The genus has hitherto been represented by only two species, from both of which the plant here described differs signally by reason of, among several other characters, its minute leaves, its small glomerules of heads, its at most shortly spinulose-acuminate involucral leaves, and its pappus of twelve scales.

Monechma angustissimum, sp. nov. Suffrutex e caulibus sat validis et verisimiliter decumbentibus laxiusculis angulatis ultimis foliosis necnon glanduloso-pubescentibus et mox glabris, foliis sæpe approximatis et pseudoverticillatis angustissime linearibus sursum parum dilatatis sessilibus obtusis apice haud recurvis in sicco sæpissime conduplicatis glanduloso-pubescentibus mox glabris, floribus sessilibus ad apices ramulorum approximatis, bractea foliis consimili bracteolas bene excedente, bracteolis calycis lobos subæquantibus glanduloso-pubescentibus angustissimis, calycis lobis 4, corolla calycem breviter excedente extus glanduloso-pubescente tubo brevi labio postico oblongo-ovato emarginato labii antici lobis ovatis obtusissimis intermedio quam laterales latiore, ovarii loculis 2-ovulatis ovulis inferioribus solummodo fertilibus, capsula calycem excedente utrinque angustata sursum glanduloso-pubescente 2-sperma.

Hab. Between Schmidt's Drift, Vaal River, and Griqua Town.

Radix e fibris multis rigidis consistens. Caules primarii circa 0·5 cm. diam., cortice aliquantulum subereo obducti; ramuli decumbentes, sæpissime 20·0–30·0 cm. long., 0·015 cm. diam.; ramuli ultimi 2·0–7·0 cm. long., longiores deorsum demum nudi. Folia circa 0·8–1·0 cm. long., raro 1·5 cm. attingentia, 0·1–0·15 cm. lat., una cum bractea bracteolisque ætate decoloria. Bracteolæ modice circa 0·6 cm. et calycis lobi 0·55 cm. long. Corollæ verisimiliter albæ in toto fere 1·0 cm. long. tubus 0·3 cm. long., 0·2 cm. diam.; limbi labium posticum 0·5 cm. anticum 0·6 cm. long.; hujus lobus intermedius 0·22 cm. long., 0·28 cm. lat. Antherarum loculi inter se subæquales, 0·12 cm. long., inferioris calcar inflexum, 0·07 cm. long. Discus 0·05 cm. alt. Ovarium fere 0·2 cm. long. Stylus 0·6 cm. long., puberulus. Capsula 0·65 cm. long. Semina levia, fusca, vix 0·2 cm. diam.

Nearest *M. namaense* C. B. Clarke and *M. nepetoides* C. B. Clarke, from which it differs by its very narrow leaves and several details of floral structure.

New East African Plants from Mr. Alexander Whyte.

Mr. Alexander Whyte, well known for his work in Nyassa Land, has recently given the British Museum a collection made upon the coast of British East Africa. Mr. Whyte botanized north of Mombasa to Witu and Lamu, and south of that town to Shimoni. Of the *Compositæ* and *Acanthaceæ*, the following appear to be new.

Vernonia (§ Tephrodes) **homilantha**, sp. nov. Verisimiliter fruticosa caule erecto folioso subtereti dense ac breviter subfulvo-pubescente, foliis superioribus solummodo visis oblanceolato-oblongis apice obtusissimis ibique nigro-apiculatis deorsum in petiolum brevem gradatim attenuatis marginibus varie dentatis vel etiam dentato-lobulatis summis integris vel leviter undulatis omnibus pag. sup. scabridulis pag. inf. dense pubescentibus, capitulis parvulis circa 8-flosculosis in cyma terminali aperte ramosa multicapitulata pubescente folia multo excedente dispositis, involucri campanulati insigniter abbreviati glanduloso-puberuli phyllis 3-serialibus extimis parvis subulatis reliquis longioribus oblongis vel oblongo-obovatis obtusis medio nigrolineatis, flosculis bene exsertis, achæniis brevibus cylindrico-turbinatis setosis evanide costatis, pappi involucrum longe superantis setis exterioribus paucis inter se inæquilongis interioribus scabridis albis.

Hab. Coast, north of Mombasa.

Foliorum lamina modice 5·0–6·0 cm. long., et 1·7–2·5 cm. lat., chartacea; petiolus ± 0·5 cm. long. Cyma circa 12·0–15·0 cm. long. et diam., foliis magnopere imminutis raro bracteata; pedunculi proprii legitimi 0·2–0·4 cm. long. Involucrum modo 0·25 cm. long.; phylla extima 0·1 cm., intima vix 0·25 cm. long., hæc adusque 0·12 cm. lat. Corollæ intense violaceæ, extus glandulis paucis sessilibus nitentibus onustæ; tubus cylindricus, 0·35 cm. long.; limbi lobis lineari-lanceolatis, 0·2 cm. long. Achænia modo 1·0 cm. long.; pappi setæ exteriores 0·1–0·2 cm., interiores 0·4 cm. long.

Near *V. cinerascens* Sch. Bip., but with quite different leaves, much larger cymes, a shorter and fewer-rowed involucre with obtuse leaves, a cylindrical corolla to its florets with narrower and longer lobes, smaller achenes, and a different outer pappus.

Barleria (§ Eu-Barleria) **Whytei**, sp. nov. Ramis gracilibus subteretibus pilis strigosis onustis mox glabrescentibus, foliis subsessilibus panduriformi-ellipticis breviter cuspidatis basi cordatis integris utrinque cystolithis conspicuis indutis et pilis paucis strigosis appressis, floribus in racemis unilateralibus plurifloris axillaribus terminalibusve digestis, foll. flor. ovatis obtusis quam calyx brevioribus bracteæ subsimilibus, sepalis majoribus inter se subæqualibus late ovatis obtusis antico integro una cum foll. flor. et bracteis strigoso-pubescentibus deinde nitentibus, corollæ verisimiliter cæruleæ tubo tenui calycem longe superante puberulo limbi lobis obovatis obtusissimis, staminibus brevissime exsertis, staminodiis 2 antheriferis tertio filiformi, capsula ovoideo-oblonga 2-sperma.

Hab. Coast, south of Mombasa.

Folia 6·0–11·0 cm. long., 3·0–5·0 cm. lat.; petioli 0·4 cm. long. Racemi usque ad 8-flori, 2·5–3·0 cm. long. Foll. flor. ± 1·3 cm.

long. Sepala 2·0 cm. long., 1·5 cm. lat.; minora 0·5 cm. long. Corollæ tubus 2·5 cm. long., 0·22 cm. diam.; lobi circa 0·8 cm. long. Filamenta 1·1 cm., antheræ 0·22 cm., staminodiorum filamenta 0·25 cm., horum antheræ reniformes vix 0·1 cm. long. Capsula nitens, fere 1·5 cm. long., 0·6 cm. lat. Semen 0·5 cm. diam.

This has much the look of the Indian *B. strigosa* Willd. The panduriform leaves, long racemes, broad sepals and narrow-tubed flowers are the chief characteristics.

AGARICUS (COLLYBIA) HENRIETTÆ, SP. NOV.

By Worthington G. Smith, F.L.S.

Pileus dry, even, somewhat downy, somewhat yellowish umber, 4 in. diam. Stem attenuate upwards, subpruinose, even, slightly rooting; pale pallid yellowish brown within and without, 7¾ in. long, ¼ in. thick. Gills ⅝ in. broad, broadly adnate, distant, slightly rounded near the stem. Flesh very thin. Spores ·0005 in. × ·0007 in.

Intermediate between *A. radicatus* Rehl. and *A. longipes* Bull. On and about stumps, trees, &c. September.

This species differs from *A. radicatus* in the dry, even, not glutinous, rugose pileus, and in the much thinner flesh; in the even, subpruinose, not sulcate and glabrous stem, and in the broadly adnate attachment of the gills to the stem. It has not the fleshy velvety pileus and stem of *A. longipes*, and differs widely in the attachment of the gills to the stem, adnexo-free in *A. longipes*.

In the newly issued part of the Transactions of the British Mycological Society (March, 1903), p. 14, this species appears to be described under the name of "*Collybia subelevata* W. G. Smith" by Dr. M. C. Cooke. Neither the description nor the name is mine, and I have seen the same description with another author's name. It must have been drawn up by someone from imperfect notes, and from an imperfect copy of the original drawing in the British Museum. At any rate, no such species as *C. subelevata* exists. In my plant the gills are broadly adnate, not adnexed.

SHORT NOTES.

Ricciocarpus natans in Warwickshire.—Mr. Samuel P. Bolton, of the Birmingham Natural History and Philosophical Society, has found this rare Hepatic in abundance in a pool at Berkswell in Warwickshire. Although I have closely worked Warwickshire in times past, I have never found it, nor do I know of its occurrence in the neighbouring counties of Stafford and Worcester. Mr. Pearson, in his valuable work on the *Hepaticæ of the British Isles*, only records it from five stations.—J. E. Bagnall.

Meum athamanticum Jacq. in Argyle.—Mr. Harry Fisher, of Castle Lodge, Knaresborough, informs me that he found this growing

in meadows by the Orchy, Dalmally, last summer. It is not given for v.-c. 98 in *Topographical Botany*, ed. 2.—Edward S. Marshall.

Monmouthshire Plants.—In an afternoon walk on July 3rd of last year, near Portskewet, we discovered the following species, apparently not recorded for vice-county 35, growing on limestone:—*Trifolium scabrum* L., *Orchis pyramidalis* L., *Koeleria cristata* Pers., both type and var. *gracilis* (Borean). We also found, in a low-lying wood, three plants of a sedge which we believe to be *Carex divulsa* × *vulpina*, associated with plenty of the supposed parents; it recalled *C. axillaris* Good. in habit to a certain extent, but differed from it in many respects. We are unaware whether this hybrid has been found on the Continent; it seems to be new to Britain.—Edward S. Marshall, W. A. Shoolbred.

NOTICES OF BOOKS.

History of Pre-Clusian Botany in its relation to Aster. By Edward Sandford Burgess. (Memoirs of the Torrey Botanical Club. Vol. x.) New York. 8vo, pp. xii, 447. 1902.

This volume appears to occupy a place by itself; no other seems quite comparable with it in design and execution. In range it is the most restricted of any volume relating to early botany which has come into our hands, and yet a vast amount of research and scholarly labour has been expended on its compilation. We have here presented the classical and mediæval history of a few species of Old World *Aster*, the detailed history ending in 1600, on the threshold of modern botany. Like Meyer's *Geschichte der Botanik*, the very early history is elaborated at extreme length, and when we look for it to be linked on to our modern knowledge, both books practically stop. The earlier work was stopped by the regretted death of the author; we trust that the author of the present book will give the world his second part, which is hinted at in the title and in the prefatory matter. Should he do so on the same scale, the whole work will be monumental.

The author starts with a "Brief Sketch of the General History of *Aster*," in less than eleven pages, tracing the trend of published facts down to 1898. This is divided into five parts:—I. The early or nebulous phase, from about B.C. 320, "or perhaps a hundred years earlier." II. The Dioscoridean period, A.D. 65–1576. III. The Clusian or agglutinative period, 1576–1720. IV. The Linnean period, beginning with Vaillant, 1720, to Nees von Esenbeck's *Synopsis*, 1818. V. The segregation period, 1818–1898.

It will be seen that the volume before us is practically confined to the first and second periods; in treating this Prof. Burgess considers the ancient type, Aster atticus of Dioscorides, *Aster Amellus* L., and Amellus of Vergil. We have set before us a digest of ancient descriptions and beliefs, the early regard for this plant, its folklore, properties in medicine and economic use in dyeing; plasters and salves in which it was an ingredient, and dis-

cussion of its various names. These headings are copiously supported by citations from the authors laid under contribution.

Next appear "Plant-writers before Clusius"; beginning with Hippocrates, passing on to Aristotle, Theophrastus, Vergil, Celsus, and Columella (to take the principal names only), are separately reviewed; then entering the Dioscoridean period with Pliny, Galen, and Oribasius, we pass on to later Roman writers, as Palladius, and Byzantine authors, ending with Paulus Ægineta; in succession come Arabian writers and the later Greeks. "Mediæval Plant-writers" brings before the reader the School of Salerno, its influence, and the work known by its opening phrase as "Circa instans," termed by Prof. Burgess "the focus of mediæval plant-lore," and the source of "Le Grant Herbier" (more familiar in this country in its English version as "The Grete Herball"), whose compiler was Matteo Plateario.

German and miscellaneous plant-workers, from Hildegardis and Albertus Magnus, including Bartholomæus Anglicus, and Pier de' Crescenzi, are then enumerated with appropriate commentaries; and at last we approach the dawn of modern science, with such men as Brunfels, Bock, and Leonhard Fuchs, covering ground which is more or less familiar to all of us.

Down to this period *Aster* was regarded as monotypic, but with the advent of Clusius and his fellow-countrymen, Dodoens and Lobel, more discrimination was shown. Clusius enumerated eight species of *Aster*, and with this widened outlook the author closes his review. Regarding polytypic *Aster*, he says (p. 418):—"Into these periods it is not at present our purpose to enter; the details of *Aster* history, as already remarked, are better pursued, after Clusius, species by species." Some addenda and errata, a page to each, and the index bring the volume to a close.

It is somewhat unfortunate that Prof. Burgess seems to be entirely unaware of the recent researches of M. Legré, whose labours have cast a flood of light into many dark passages in the history of such men as Pena, Lobel, and Clusius himself, for then many statements would have been otherwise expressed. Some of the translations are too free, and Meyer's phrase alluded to on p. 253 is incorrectly rendered. But the reviewer has no desire to be captious; the bald account here given conveys very little idea of the enthusiastic manner in which the author has set out every sentence in the works of the writers and authorities referred to, who could in any way shed light on *Aster*. Meyer's phrase just alluded to seems most apt with regard to this volume: "Man muss das Buch selbst benutzen" (*Gesch. Bot.* iii. 513).

B. Daydon Jackson.

A Preliminary List of the Alien Flora of Great Britain. By S. T. Dunn, B.A., F.L.S. 8vo, pp. 30. Price Fourpence. West, Newman & Co.

The British botanist who opens Mr. Dunn's list at random—say at p. 21—is likely to receive a shock when he finds *Daboecia* (which priority-lovers must call *Boretta*) *polifolia*, *Erica vagans*, and

E. mediterranea—plants which emerged from Mr. Watson's ordeals without a stain of suspicion on their character—figuring among aliens; and he will not be reassured by further investigation of its pages. When he reads the preface, however, he will find that these and all the italicized species, although placed under the general heading of "aliens," are "probably natives." How then did they come *dans cette galère*? Because, says Mr. Dunn, they "have so far been exclusively or chiefly recorded in Floras in their non-indigenous localities." Whereat the botanist who happens to have been in Connemara when every heath and roadside is gay with the beautiful St. Dabeoc's Heath rubs his eyes, and proceeds to look up its history. Mr. W. R. Clarke sends him to Ray's *Historia Plantarum* for its first record (1704), and he reads that "in montibus Mayo squalido et spongioso solo frequens est, ut et per totum Hiar-Connacht in Gallovidia." Moreover, its name commemorates an obscure Irish saint of the early period of Christianity, and the local custom attributed to the "mulierculæ superstitiosæ" may even be pre-Christian. It is of course true that the plant has been noted as an introduction in Oxfordshire and elsewhere, and that *Erica vagans*, whose record for Cornwall goes back to 1670, has become introduced in other places; but how can it be asserted that such plants have "so far been exclusively or chiefly recorded in Floras in their non-indigenous localities"?

We think that Mr. Dunn has somewhat weakened the position he has taken up by including among "aliens" plants of which the above are examples. His interesting and suggestive paper on the origin of the Deadnettles in Great Britain (*Journ. Bot.* 1902, 306) shows that he has studied our native flora with remarkable care, and that his conclusions are well worth consideration.

The list as it stands contains 1194 species, one of which—*Lotus tetragonolobus*—by some accident appears under two names and in two natural orders, and has the misfortune to be misspelt each time (it must be said that the orthography of the list suggests that the proofs were never corrected). The author had intended to produce "a more elaborate work on the subject," but this project, though not finally abandoned, has been postponed in consequence of his appointment to the Botanical and Afforestation Department in Hong Kong. Meanwhile he invites additions, corrections, and contributions, to facilitate which he has issued a bound and interleaved copy of the list, which may be had from the publishers at the low price of 6d.

BOOK-NOTES, NEWS, &c.

At the meeting of the Linnean Society on 19th February, Mr. John Clayton, of Bradford, presented a set of thirty-two photographs to illustrate the celebrated Cowthorpe Oak, near Wetherby, Yorkshire. From the time of John Evelyn this oak has been described, measured, and its age guessed at. Mr. Clayton, in a

printed summary of twenty-two pages, gives an account of the various observers who have mentioned the oak in question, and many of the photographs are designed for comparison with other remarkable trees, among them the Crowhurst Yew in Sussex, the great Chestnut at Tortworth, and the Greendale Oak in Welbeck Park. In 1893 careful measurements and photographs were made of the tree, on four different visits in January, April, June, and October. The author's deduction from these data is that the age of the tree has been greatly over-estimated, his own belief being that five hundred years is the extreme limit of its age, from sapling to its present decrepitude and decay. A description of the tree by Charles Empson, with a lithograph from a painting by G. W. Fothergill, was published in 1842, and a plate by W. H. Hanmer in 1806.

To the same meeting a paper "On the Electric Pulsation accompanying Automatic Movements in *Desmodium gyrans*" was contributed by Prof, J. C. Bose, who demonstrated to the Society, a year ago, that any living part of a plant, when stimulated mechanically, gives an electric response. On the present occasion he gave the results of his investigation of the question as to whether or not spontaneous movements are accompanied by an electric disturbance comparable to that resulting from external stimulation. The most striking case of spontaneous movement is that of *Desmodium gyrans*. The leaf of this plant is trifoliolate, consisting of two small lateral leaflets and a larger terminal leaflet. The lateral leaflets move up and down, the period of a complete up and down movement, in the plants observed, being about three and a half minutes. Having placed one electrode on the petiolule of a leaflet, and the other on the petiole of the leaf, both in connexion with a galvanometer, Prof. Bose found that the spontaneous movement is associated with an electrical disturbance of a peculiar kind. There is first a large principal wave of disturbance, followed by a smaller subsidiary wave; the period of the former being about one minute, that of the latter about two and a half minutes. This disturbance is the expression of a "current of action" travelling in the plant from the excitable petiolule to the resting petiole. The relation of the double wave of electrical disturbance to the movements of the leaflet was found to be this:—The principal wave attains its height during the downward movement of the leaflet; the leaflet rests for a brief space at its lowest position, during which time electrical recovery takes place. The leaflet now moves upwards, and then the second or subsidiary wave of electrical disturbance is produced. This relation is established by simultaneous records of the movements and of the electrical disturbances, which further show that the greater amplitude of the principal wave of electrical disturbance is the concomitant of the greater velocity of the downward, as compared with the upward, movement of the leaflet. Some interesting observations are given upon the recurrence of periodic fatigue in the leaflets, followed by a restoration of activity; as also upon interference effects resulting from placing the two electrodes

upon the petiolules of the two leaflets in different phases of movement.

Mr. E. S. Salmon, at the same meeting, read a paper on Specialization of Parasitism in the *Erysiphaceæ*. He began by explaining the term "biologic form," by instancing two fungi which were not distinguishable morphologically, but which acted in diverse fashion on the same host-plants. This phenomenon had been known in the *Uredineæ* for some time, but its discovery in the *Ergsiphaceæ* was not announced until the beginning of 1902. In the summer of 1902 the author carried on a series of experiments in the Botanical Laboratory at Cambridge, using the biologic form *Erysiphe graminis* 'f. *Bromi*.' Over three hundred pots of seedling grasses were inoculated (four to six leaves in each pot), and the results obtained from the series of comparative infections pointed to the existence of four, or more probably five, "biologic forms" existing on *Bromus interruptus*, *B. hordeaceus*, *B. commutatus*, and *B. tectorum* and *B. arvensis*. It was pointed out that there was reason to believe that the species *B. tectorum* may serve, from the point of view of the fungus, as a bridge between the species of the sections *Serrafalcus* and *Stenobromus*. The author also pursued his researches on the forms of *E. Graminis* on wheat and oats; the result showing that the wheat-form cannot touch barley, rye, or oats, nor *Agropyron repens*, but it infected *Triticum Spelta*. The oat-form cannot infect wheat, barley, or rye, but it can attack other species of rye. Finally, experiments were made with *E. Polygoni* on *Trifolium pratense*, which proved unable to infect seven other species of *Trifolium* (besides species of *Lotus*, *Medicago*, *Melilotus*, *Lupinus*, and *Pisum*), but it always succeeded on its own host-plant. The form of *E. Polygoni* on *Pisum sativum* infected *P. arvense*, but could not touch species of *Trifolium*, *Onobrychis*, *Colutea*, and *Lupinus*.

Bryologists will note with pleasure that the recently issued Part xxii. of Dr. Braithwaite's *British Moss-Flora* (published by the author at 26, Endymion Road, Brixton Hill, March, 1903, pp. 169–200, plates cxv–cxx, price 6s.) brings the work so near to its end that only one more part remains to be printed; for the *Sphagnaceæ* will be put into other hands for treatment. In the present part twenty-three species are described and twenty-six figured. The three remaining species of *Stereodon* are given and followed by four other Hypnaceous genera—*Isopterygium* (six species), *Plagiothecium* (six), *Acrocladium* (one), *Entodon* (one). Then come three Pterygophyllaceous genera — *Pterygophyllum*, *Cyclodictyon*, *Daltonia*, each with one species; and, finally, two Neckeraceous genera—*Porotrichum* and *Homalia*, with two and one species respectively.

The Catholic University of Lyons, which is in possession of the herbarium of Alexis Jordan, is about to distribute the numerous duplicates which it contains. Further information may be obtained from M. E. Reverchon, Place Choulans, Saint-Just, Lyons.

THE OXLIP, COWSLIP, AND PRIMROSE.

(Plate 451.)

[Mr. Charles Bailey has reprinted, with additions, from vol. i. pp. 26–35 of the *Proceedings of the Manchester Field Club*, an address delivered at one of its meetings, of which, with his permission, we print the following portion, with its accompanying illustrations. Mr. Bailey appended to the paper, the purpose of which was to stimulate the younger members of the Club, a list of localities from his very extensive herbarium, showing the distribution over Europe and Asia of the species of *Primula* § *Primulastrum*. We note that Mr. Bailey, in his introductory remarks, says that he has not been able to "detect any special odour" in the flowers of the oxlip; to us this seems very marked, resembling that of the Grape Hyacinth. After a reference to the dimorphism of the plants, Mr. Bailey continues :—]

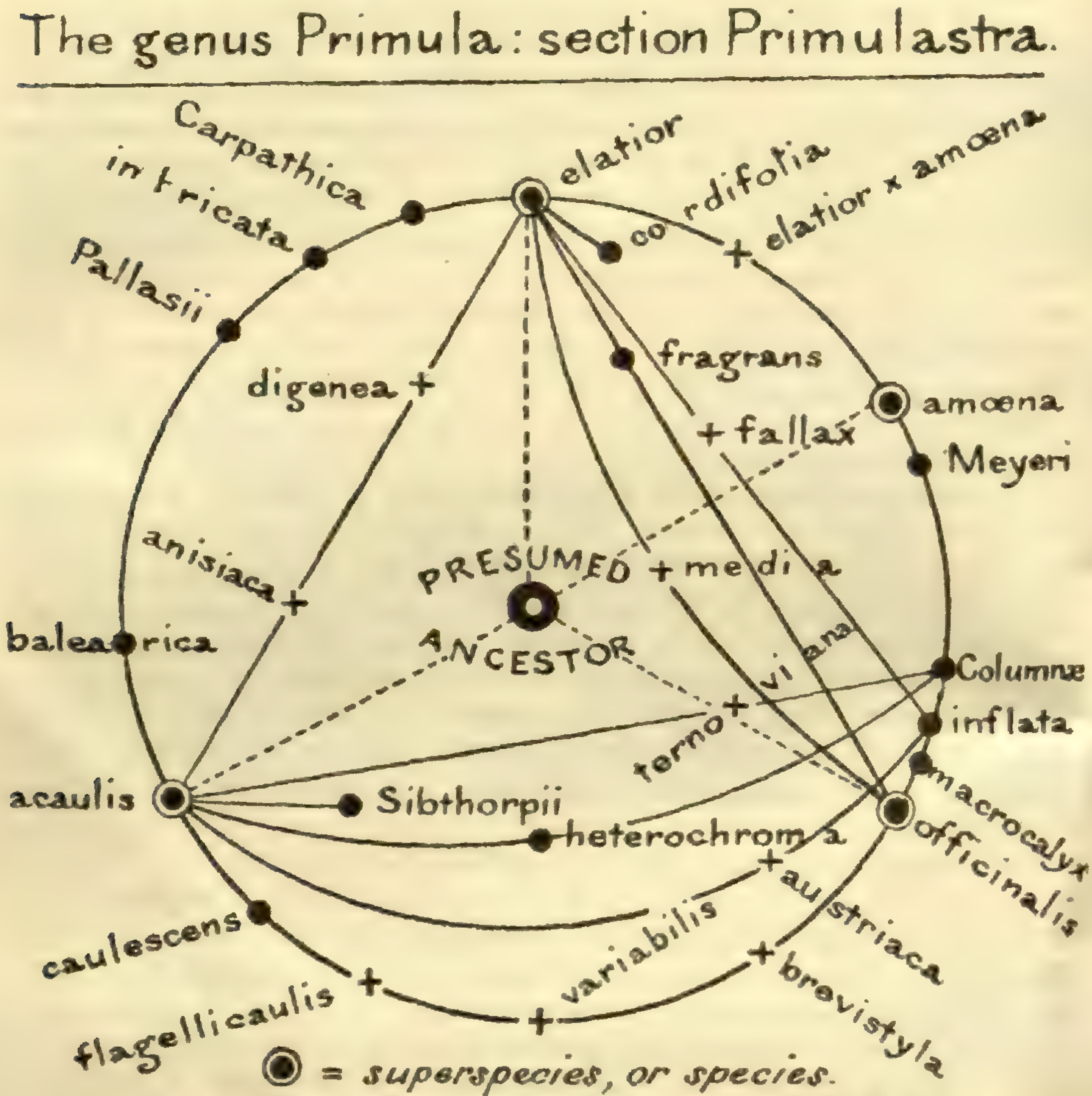
It has been found that hybridization is of frequent occurrence amongst species of *Primula*, but it is more especially the case in the particular section of the genus to which the primrose, cowslip, and oxlip belong—viz. the section *Primulastra* of Linnæus, or, as Pax has recently named it, *Vernales* or *Veres*. In nature, the primrose hybridizes with the cowslip, and both of these with the oxlip; the hybrids of these in their turn cross with each other, and with the types, with the result that botanical literature is burdened with a multitude of names which have been imposed upon the forms thus produced.

It is only during the last half-century that the hybrid origin of many of the common crosses in this group has been established; thus, Godron in 1844 proved by experiment that the frequent *P. variabilis* Goupil of the continent of Europe is derived from the cowslip being pollinated by the primrose. Further the common polyanthus of our gardens is undoubtedly of hybrid origin, but there is no agreement among horticulturists or botanists as to its ancestry, as it has been crossed and re-crossed so often that we cannot now disentangle the origin of the multi-coloured bizarre forms of this favourite garden plant.

The truth is that this group of the genus is in a state of great instability; even the synthetical genius of Linnæus perceived that however different they might be from each other, he felt constrained to consider them as only forms of one species. If the Caucasian *P. amœna* of Bieberstein had had a western extension over the continent as far as the British Islands, still greater plasticity, and consequent confusion, would have occurred if the area had been occupied by the four species.

It is somewhat difficult to represent in a diagram a natural grouping of all these forms according to their affinities, but an attempt has been made below to set forth the interrelations of the oxlip and its allies, based largely upon the scheme of Dr. Ferdinand Pax, of Breslau, in his paper on the genus *Primula*, in Engler's

Botanische Jahrbücher, vol. x. 75–241 (1888). It should be noted that this diagram does not include all the members of the genus, but only those which are included in the *Primulastra* section, to which the oxlip belongs.



Interrelations of the Oxlip (*P. elatior*), Cowslip (*P. officinalis*), and Primrose (*P. acaulis*); with their allies and hybrids.

The centre of the sphere is filled with an assumed ancestral super-species, from which have probably been evolved its three or four modern representatives: the oxlip (*P. elatior* Jacq.), the Caucasian cowslip (*P. amœna* M. Bieb.), the cowslip (*P. officinalis* Scop.), and the primrose (*P. acaulis* Jacq.), marked on the diagram with a circle round a solid centre. From each of these certain well-marked subspecies have been derived, which are represented by a solid dot; in their turn these latter have hybridized with each other ,and with their ancestral types; the upright cross indicates

the principal hybrids, and the lines on either side the cross connect it with the assumed parents. No attempt has been made to represent in this diagram anything beyond the primary, secondary, and tertiary forms; but nature produces quaternary and more remote forms which defy analysis.

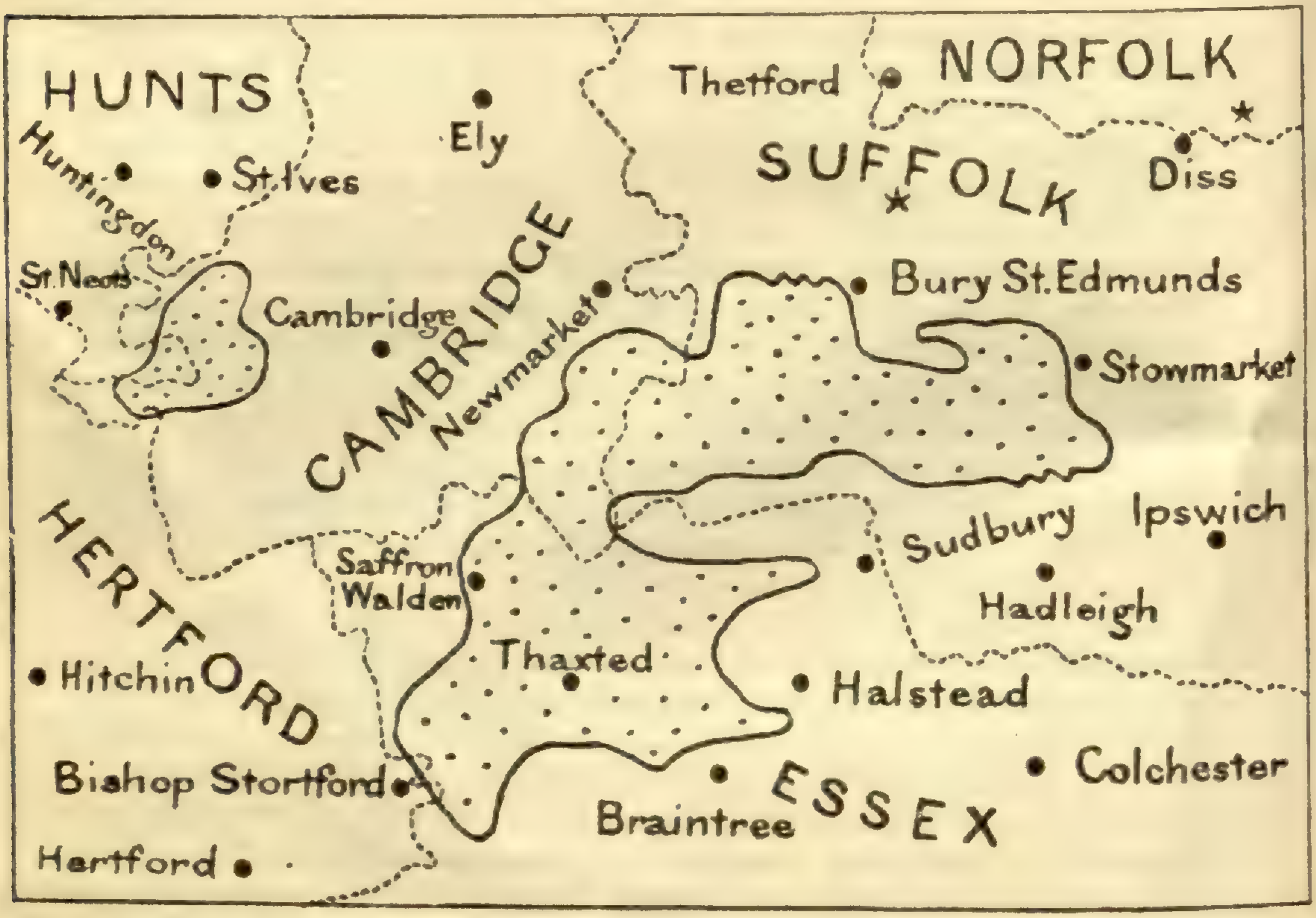
Besides the above considerations respecting their interrelations in structure, these plants have most interesting relations in space, the illustration of which must be confined to the British Islands. The habitats of these plants are not alike; the primrose is a plant of the shade, liking woods, and sheltered railway slopes and hedge banks; the cowslip is a plant of the meadows, delighting in the open, and it flowers about three weeks later than the primrose. But what abont the habitat of the oxlip? Many would say that while not so common as either the primrose or the cowslip, it was fairly plentiful wherever the primrose and cowslip occur, and that it was generally met with in the open. This association of the oxlip with the primrose and cowslip presupposes that the oxlip is of hybrid origin, and indeed almost all the plants which pass in this country for native oxlips, from other than the eastern counties, are the result of the primrose being pollinated from the cowslip. In that case the fertilization comes from the pollen of an early cowslip being conveyed by insects to the stigma of a late primrose. Such hybrids are by no means infrequent, and in our part of the country they occur at Ashley and Mobberley in Cheshire; in several places in Derbyshire, as at Ashbourne; and in North Wales, as at Gloddaeth; and they are common in Wharfedale and other Yorkshire dales. But all these are spurious oxlips, not Jacquin's oxlip, as the following remarks will make clear.

The area which Jacquin's oxlip occupies in this country is enclosed for the most part in an inverted triangle whose western point is near St. Neots in Huntingdonshire; its eastern point is at Stowmarket in Suffolk; while its southernmost point is a little south of Bishop Stortford in Hertfordshire. Not that the oxlip is equally spread all over this area, for excepting a small patch between St. Neots and Cambridge it does not grow west of a line drawn from Newmarket to Bishop Stortford. The upper half of the principal oxlip area is in Suffolk and the lower half in Essex. Its limits have been laboriously pegged out by Mr. Miller Christy, and the result of many years' work is recorded in an interesting paper published in the *Journal of the Linnean Society* (Botany), xxxiii. 172–201 (1897). This paper is accompanied by a map of the districts occupied by the oxlip in Great Britain, from which the rough sketch given above is taken, and from the same paper have been derived most of the facts which follow connected with its distribution in the eastern counties.

This sketch shows at a glance how restricted and peculiar is the district thus occupied; the two larger areas concerned are indicated by the round dots marked within the bounding lines, and there are two other insignificant outlying patches (marked with a star on the sketch-map), in Suffolk south of Thetford, and in Norfolk east of Diss.

The conditions of the life of Jacquin's oxlip will be better apprehended if some details are given of the kind of area which it occupies in this country and of its relation to the primrose and cowslip within, or surrounding, its area of occupation. The principal portion of the ground on which it is native is included within the counties of Essex, Suffolk, Cambridge, Hertford, and Huntingdon. The line of railway from Linton to Haverhill bisects the area in two nearly equal portions, containing about two hundred square miles each. No towns of any size, nor any rivers or canals, are met with on this area; various lines of railway surround it, but only

Area of occupation in England of the Oxlip, *Primula elatior*, Jacq



The Oxlip is confined to the two dotted areas, & to the two spots marked ★

three cross it at its narrowest parts. Its avoidance by towns, railways, and canals brings out one of the special features of the oxlip area, namely, that it consists of an upland district—the watershed of those portions of the counties which it occupies. It is rare to find the oxlip descending below the level of two hundred feet above the sea; accordingly, it is looked for in vain in the valleys which indent the margin of the area of occupation. Another feature of this area is that the oxlip avoids the chalk, the gault, and the greensand, and confines itself to the boulder-clay even where the latter occurs above the two hundred feet contour-line. A third feature disclosed by its place of growth is that it is a woodland plant. It is "love's labour lost" to search for it along river

banks, brook sides, railway embankments, or meadow-lands. Although it is a flower of the woods, it flourishes best after the trees are cut down; these are mainly hazels, which are cut down every dozen years, in annual sections so as to preserve sufficient cover for the game. On denuding the woods the ground receives an accession of air and light which develops the latent life of the plants growing therein, and in the year or two following the cutting-down there is a glorious carpet of oxlips quite as profuse as are the cowslips and primroses in their respective haunts. The fact that most of these woods are preserved for game does not make them easy of access, but a respectful request to their owners, and a promise to avoid disturbing the game, generally secure permission to visit them.

We have now to notice the relations of the oxlip to the cowslip and primrose, upon, and in the neighbourhood of, its area of occupation. One fact, in this connection, which forces itself upon the attention of the phytologist, is the prevalence of the cowslip all over the area, and a still more striking fact is the complete absence of the primrose from the same area. The only primroses to be seen are those cultivated in the gardens of the cottagers, who, when asked where they came from, invariably mention some locality quite off the oxlip area. On the other hand, where the primroses come up to the boundary of the area, an abundance of hybrid forms between the oxlip and the primrose occurs on the boundary line, but there is a striking absence of hybrids between the oxlip and the cowslip, notwitstanding the abundance of the latter all over the oxlip area.

No doubt, as Mr. Miller Christy surmises, the frequency of crossing between the oxlip and the primrose is due to the fact that both plants are contemporaneous in their periods of flowering, whereas the cowslip is about three weeks later than either. But the extreme rarity of crosses between the oxlip and the cowslip in this country, coupled with the great frequency with which the cowslip invades the oxlip area, suggests that the oxlip has closer racial affinities with the primrose than it has with the cowslip.

The probability is that all these species have had a common ancestor, which was probably nearer to the oxlip than to anything else. In the course of its distribution in space, and in evolution, one branch has developed into the primrose, another into the cowslip, a third into the oxlip, and a fourth into the Caucasian cowslip. Each of these four branches hybridizes with the rest, and they have thus produced the large number of forms included in the diagram of affinities given above.

The sum of all these considerations, therefore, establishes the circumstance that the numerous mock oxlips of the north of England are not Jacquin's oxlip, the affinities of which have been the subject of this address.

SOME ENTIRE-LEAVED FORMS OF LAMIUM.

By G. S. Boulger, F.L.S.

As Mr. Dunn has well shown,* from a study of their distribution, the majority of those well-known weeds of cultivation, the deadnettles, which figure in our floras, are mere colonists, occurring only in cultivated land, and thus extending far beyond their original area of distribution. Speaking of *L. amplexicaule*, moreover, he suggests that this species has actually originated under such artificial conditions. Such may, therefore, also be the origin of three well-marked forms with entire leaves which are represented in the older herbaria, but seldom at the present day.

Of these, I will take first the one which, under the name *L. molle* Ait., forms the main subject of Mr. Britten's paper in this Journal for 1899, p. 130. The first mention of this form which I can find is in Joncquet's *Hortus* (1659), p. 69, where merely the name "Lamium Parietariæ foliis" occurs, followed by the authority "D. Brunyer." There is no mention of the plant in either the first (1653) or the second (1655) editions of Brunyer's *Hortus Regius Blesensis;* and it is noteworthy that in Morison's first description of it (*Hort. Reg. Bles.* (1669) p. 279), and in the quotation and translation of the name by Sutherland (*Hort. Edin.* (1683) 181), both quoted by Mr. Britten, there is no mention of any Virginian or American origin for the plant. It is, perhaps, also worth noting that when Morison says of it (*loc. cit.*) "in omnibus Lamio vulgari accedit," he is certainly referring to *L. album;* whilst when (*Hist. Pl. Oxon.* iii. 385) he, or Buddle, writing of "Lamium annuum rubrum Parietariæ foliis," says "à vulgari non dignoscitur," he is speaking of *L. purpureum.*

Plukenet's enumeration (*Almagestum* (1696), p. 203) runs: "Lamium album Parietariæ folio Virginianum, Phytogr. Tab. 41, fig. 1. Lamium Parietariæ facie, Moris. Prælud. Bot. 278. Lamium Parietariæ folio Bruynero, Hort. Joncquet. 69." The type of the figure—not a very good one—in his *Phytographia* is in the Sloane Herbarium (lxxxiii. f. 233), and seems to have been gathered in Edward Morgan's Westminster Physick Garden; but, as the many references to that collection given by Mr. Britten clearly show, the plant was present in many botanical gardens in the latter part of the seventeenth century.

So far as the wording and the synonymy of Solander's description in Aiton's *Hortus Kewensis*, ii. 297, go, the reference is entirely to this form, so that, were it recognized as a species, it would be entitled to the name *L. molle* Ait., and *L. parietariæfolium* Benth. would sink as a mere synonym; nor does the unfortunate fact that Solander has endorsed a sheet of the Banksian herbarium, bearing not only this form but also another, with the name *L. molle* alter the effect of his published description.

In Sir J. E. Smith's herbarium there is no such confusion, this

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* *Journ. Bot.* 1902, p. 356.

form appearing under *L. molle* Ait., with the reference to Plukenet's figure and description and the synonyms given by him.

Whilst Solander's unfortunate endorsement of the Banksian specimens undoubtedly misled Bentham, that monographer never quite corrected his error, as Mr. Britten seems to think he did. His first note (*Labiatæ* (1832–6), p. 512) is :—" L. purpureum . . . β. molle, foliis minus rugosis, obtusioribus, pauci-crenatis. L. molle Ait.! Hort. Kew. 2, 297, fide Herb. Banks." To which is added the cautious note :—" Huic adjecta sunt in herbario Banksiano exemplaria 2, ex horto quodam antiquiore, quæ ad speciem propriam corollæ forma distinctissimam pertinere videntur, sed ob exemplaribus mancis a vermibus partim destructis describere nequivi."

Later on in the same work (p. 739) he sinks *L. ocimifolium* Sm., which represents one of the two forms on the Banksian sheet, under *L. purpureum*, and proposes, as Mr. Britten points out, the new species *L. parietariæfolium*, adding the query, " An *L. vulgati* var. insignis in hortis orta ? " ; and the note, " I have not adopted the name of *L. molle*, as that appears to have been given by Aiton originally to the entire-leaved variety of *L. purpureum*. Both are in the Banksian herbarium on the same sheet under the name of L. molle."

In that revision of the Order, Bentham lumped *L. album* and *L. maculatum* under the revived pre-Linnean name *L. vulgatum;* and his subsequent treatment of the form in De Candolle's *Prodromus* (1848, vol. xii. p. 509) shows that he considered his *β. molle* nearer to *L. maculatum*. Why he should do so, I am at a loss to say ; for not only are the flowers white, but the calyx-lobes are as narrow as those of *L. album* and as erect. Moreover, he here retains *L. molle* Ait. as var. " β. molle," under *L. purpureum*, while quoting " L. molle hortul. et Ait. ex parte ? " under *L. parietariæfolium*.

It is somewhat remarkable that the only apparently wild specimens of this form are from Hamburg, Schleswig, and Holstein, beyond, that is, the region which Mr. Dunn assigns to *L. album* as truly indigenous. Its general habit is certainly that of *L. album*, with which it seems also to be practically identical in its flowers. Both the stems and petioles are more slender and sinuous than the type ; the petioles are often as long as in the markedly serrate Himalayan form *L. petiolatum* Royle, and the entire ovate-acuminate leaves give it a very distinct appearance ; but these may all be the correlated results of cultivation, so that it will be safest to retain the varietal name *L. album* var. *β integrifolium* in Sonder *Fl. Hamburg.* 328 (1851), pointed out by Mr. Arthur Bennett (*Journ. Bot.* 1899, 180). Did we retain it as a species, *L. molle* Ait. would, of course, take precedence of *L. molle* Boissier (*Fl. Orientalis*, vol. iv. 1879), an entirely different plant, belonging to a different section of the genus, and native to Macedonia, allied to *L. garganicum* L. of the Mediterranean region.

The second of the forms with which we are concerned is that which, having been confused with the first, is briefly mentioned by

Mr. Britten at the end of his paper. It is almost certainly the "Lamium Novæ Angliæ Parietariis foliis" of Ray's *Historia* (1686), i. 560, since he writes of it, "In reliquis ad Lamium minus accedit; foliis Parietariæ æmulis ab eodem differt." As Ray adds, "Cantabrigiæ olim in hortulo nostro coluimus," and he left Cambridge in 1662, this throws back his knowledge of the plant almost to the date of Morison's coming to England from Blois.

Plukenet (*Almagestum*, p. 204 (1696)) enumerates and (*Phytographia*, t. 41, fig. 2 (1691)) figures the plant as "Lamium pusillum *rubrum* Parietariæ facie *Americanum*," and adds, "an Lamium Novæ Angliæ Parietariæ foliis, Raii Hist. Pl. 560." In his herbarium (Herb. Sloane, lxxxiii. f. 233) there is a specimen on the same sheet as that of the first form referred to by Mr. Britten, and these seem to have come from the Physick Garden of Edward Morgan at Westminster. If this Edward Morgan, whom Evelyn in 1658 styles "a skilful botanist," and Plukenet (*Alm.* p. 191) "in rebus botanicis haud infimæ notæ," be the companion of Thomas Johnson in his Welsh journey in 1639 (*Mercurius Botanicus*, pt. 2), who is then spoken of as a herbalist, his "floruit" will date back twenty years earlier than in the *Biog. Index of Brit. Botanists* (p. 123). The statement in Ray and Plukenet that the plant was of American origin may have been based on a statement of Morgan's, but I can find no confirmation of it elsewhere; so that the uncertainty quoted by Mr. Britten from Morison's *Hist. Pl. Oxon.* iii. 385 (1699) is justified. Morison only came to England in 1660, and died in 1683, the third volume of his great work being published, at the request of the University of Oxford, by his pupil Jacob Bobart, nineteen years after the second; and Pulteney says (*Hist. Sketches*, i. 311) that the interval "had given Bobart an opportunity of inserting a great number of plants unknown to Morison from the works of Ray, Herman, Plukenet, the *Hortus Malabaricus*, and other works." Nevertheless, the description of this plant is probably Morison's own. To make this account complete, it must be again quoted here:—

"*Lamium annuum rubrum Parietariæ foliis.* Ubi sponte nascitur, nobis non compertum. Ex horto Dom. Edw. Morgan, prope cœnobium Westmonasteriense, plurimis abhinc annis ipsi comparavimus. Radice, caulibus, floribus, seminibus, modoque crescendi, à vulgari non dignoscitur. Folia dumtaxat discrimen faciunt; quæ inferius locata minora sunt, & paullulum crenata, superiora vero marginibus æqualibus, mucronata & *Parietariæ* æmula apparent, semperque eandem facultatem retinent."

This passage, and the placing of Morison's annual red-flowered form as variety ♂ of *L. album* by Linnæus in *Hort. Cliffort.* (p. 314 (1737)), seem to have been overlooked by Sir J. E. Smith. In Rees's *Cyclopædia*, vol. xx., under *Lamium*, he writes:—

"14. *L. ocymifolium.* Basil-leaved Red Dead Nettle.—(L. pusillum rubrum, parietariæ facie, americanum; Pluk. Almag. 204, Phyt. t. 41, f. 2).—Leaves ovate, obtuse, entire, stalked; the upper ones crowded. Stem naked in the middle. Calyx-teeth lanceolate.—This has long been in Chelsea Garden, where it is

almost a weed. From Plukenet's synonym it appears to have come from America. *No succeeding author has noticed the plant.** The root is small and annual. Stem a foot high, or something less, simple, except a small branch or two near the base, erect, square, smooth, leafy at the bottom and top only, being for the greater part of its length entirely naked, like the stem of *L. purpureum*, but still more remarkably so. The lower leaves are few, roundish-ovate, slightly crenate, on longish stalks, and nearly smooth; floral ones about six or eight pairs, crossing each other, crowded together at the top of the stem, composing a sort of pyramid, each leaf about three-quarters of an inch long, stalked, ovate, obtuse, tapering at the base, entire, except here and there a casual notch in some of them, all slightly hairy, paler underneath. *Whorls* crowded, of numerous small purple flowers, much like those of *L. purpureum*. *Calyx* nearly smooth, its teeth as long as the body, spreading, broad at their base, with taper rigid points. Seed curiously besprinkled with pale, prominent, minute tubercles, as is more or less the case in the three following" [i.e. *L. purpureum*, *L. incisum*, and *L. amplexicaule*].

Smith was hardly the man to found a new species solely on geographical distribution; and in his herbarium is a sheet with three fine specimens marked "Chelsea Garden, 1786, Pluk. t. 41, f. 2, ocymifolium Sm.," which well demonstrate the strikingly distinct character of this form. They are about 10 in. high; at the base of the stem they bear small leaves on long petioles with axillary branches, above which, as Smith says, there is a long bare stem. The leaves are all petiolate, ovate-rhomboid, obtuse, and tapering at the base. The inflorescence is in no case as crowded as in *L. purpureum*, so as, *pace* Sir J. E. S., to be more like an obelisk than a pyramid.

Bentham, in his *Labiatæ* (p. 739 (1832–6)), sinks this form under *L. purpureum* without comment, merely mis-spelling the name "ocimifolium," but indicating that he had seen the type. His reference and spelling are followed in the *Index Kewensis*; but in De Candolle's *Prodromus* (vol. xii. (1848) p. 509) he has allowed "Sm." to appear as "Sims." In spite of this high authority, I would suggest that this very distinct form should at least bear the varietal name *ocymifolia*.

The third form is even closer to *L. purpureum*, though very distinct from the second. I know only two specimens. In the herbarium (now in the National collection) of Joseph Andrews, apothecary, of Sudbury, Suffolk, who seems to have been an apt pupil of Samuel Dale, and to have collected between 1717 and 1758, is one of these. It is labelled in Andrews's own handwriting:—"Lamium rubrum, foliis per ambitum nec serratis nec crenatis. It grew in my Garden & continued two year & then died. It's very different from the Common Red Nettle, viz. in its leaf as above & the flower not one forth so large; the Calyx having but 4 spinulæ & the common five—& that it produced no seed. 1742 anno prior. floret."

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* The italics are mine.—G. S. B.

In Sir J. E. Smith's herbarium is a practically identical specimen, labelled, as attested by a pencil note of Smith's, in the handwriting of Professor John Martyn (who died in 1768, when Smith was but nine years old):—"Lamium rubrum foliis per ambitum nec serratis nec crenatis, found by Mr. Joseph Andrews, Apothecary, at Sudbury in Suffolk; who says the flower is not one fourth part so large as that of the Common, & that the Calyx has but 4 spinulæ, whereas the Common has Five & that it produced no Seed."

From these two labels, compared with others in Andrews's herbarium, in which he always gives authorities for names, it would appear that the Latin descriptive name is his and not Martyn's. In *English Botany*, 769, under *Lamium purpureum*, it is stated that "there is also a more rare variety with entire leaves, *resembling those of a Parietaria*, which appears by a manuscript of the late learned Professor Martyn, sen., to have been first found near Sudbury by a Mr. Joseph Andrews. *This last is a weed in Chelsea Garden.*" In Rees's *Cyclopædia*, however, Smith writes, under *L. purpureum*, "A curious variety was found near Sudbury, by Mr. Joseph Andrews, who communicated it to the late Professor Martyn, senr., & whose original specimen is in our hands. In this the margin of all the leaves is perfectly entire. The flowers are rather smaller than ordinary & were said to produce no seed. This variety is in Engl. Bot. n. 769, at the end, mistaken for our *ocymifolium*."

This mistake, I presume, led to both the statements which I have italicized in this quotation; for the leaves of both specimens are like those of typical *L. purpureum* in all respects save their margin, *i. e.* they are broadly ovate-reniform, obtuse and cordate, and do not, therefore, resemble those of a *Parietaria*. So, too, in his *English Flora* (iii. 92), Smith has, under *Lamium purpureum*, "*β*. Lamium rubrum, foliis per ambitum nec serratis nec crenatis. Prof. Martyn Ms. Near Sudbury. Mr. Joseph Andrews . . . has the margins of the leaves quite entire; but it seems a mere variety, & is certainly distinct from my *L. ocymifolium* R. Cyclop. n. 14, an American species, naturalized in Chelsea Garden."

The small size of the flowers, which, as Andrews originally pointed out, are not "rather smaller than ordinary," as Smith puts it, but "not one fourth part so large," suggests a cleistogene condition; but the barrenness is against this. The mere lettering of a variety is inconvenient, *L. purpureum β*. of the *Prodromus* being, as we have seen, really *L. ocymifolium* Sm.; whilst *L. purpureum β*. of Relhan's *Flora Cantabrigiensis*, ed. 2, is *L. incisum* Willd. I would suggest, therefore, that this form be designated *L. purpureum* var. *Andrewsiana*.

It may be worth while to point out that none of these three forms has any claim to rank as a British wild plant. Smith's "found near Sudbury" is a somewhat misleading way of speaking of a weed in the garden of an apothecary in the town itself. Neither Ray nor Dillenius thought of including the other two forms in the *Synopsis*.

MR. KÄSSNER'S BRITISH EAST AFRICAN PLANTS.—II.

By Spencer Moore, F.L.S.

(Continued from Journ. Bot. 1902, p. 346.)

Compositæ.—II.

Vernonia Hoffmanniana S. Moore. Golunko. No. 865.

Vernonia (§ Hololepis) **rigorata,** sp. nov. Caule erecto sursum ramoso penitus folioso breviter setuloso-scabrido in longitudinem sulcato, foliis parvis subsessilibus oblongis mucronatis basi obtusis vel parum rotundatis margine crenatis crenulatisve subcoriaceis supra scaberrimis subtus dense setuloso-pubescentibus, capitulis mediocribus in cymis unilateralibus paucicapitulatis folia excedentibus dispositis multifloseulosis a foliis floralibus reliquis similibus nisi minoribus ad normam sectionis involucratis, involucri campanulati pluri- (circa 9-)serialis phyllis rigidis extimis brevibus lineari-subulatis reliquis gradatim longioribus lineari-lanceolatis rigidiuscule spinoso-acuminatis intimis quam interiora angustioribus omnibus leviter araneosis scabridis, flosculis involucrum superantibus, achæniis anguste cylindricis basi callosis 10-costatis inter costas appresse sericeis, pappi 2-seriati setis exterioribus abbreviatis interioribus sordide albis scabriusculis.

Hab. Simba. No. 724.

Folia 1·5–4·5 cm. long., 0·7–1·2 cm. lat., supra aliquantulum nitentia. Corymbus adusque 7·0 cm. long. et lat. Pedunculi proprii sæpissime 1·0–3·0 cm. long., raribracteati. Folia floralia involucrantia 0·7–1·2 cm. long. Involucrum 1·5 cm. long.; phylla intermedia circa 0·8–1·0 cm., intima 1·4 cm. long., hæc circa 0·1 cm. illa 0·13 cm. long., omnia sursum brunnea marginibus lutescenti-viridibus. Corollæ tubus inferne maxime attenuatus, raripapillosus, 0·8–1·0 cm. long.; lobi 0·4 cm. long. Achænia 0·4 cm., pappus 0·8 cm. long.

Allied to *V. purpurea* Sch. Bip., but with quite different leaves and flower-heads.

V. stenolepis Oliv. Muku. No. 897.

Vernonia (§ Strobocalyx) **Hindei,** sp. nov. Planta glabra caule erecto ramoso folioso angulato necnon striato, foliis parvis subsessilibus oblongis obtuse acutis mucronulatisve basi obtusis vel aliquantulum rotundatis margine integris distanterve denticulatis vel etiam microscopice serrulatis, capitulis parvis in corymbo aperto satis elongato foliis parum inminutis bracteato dispositis turbinato-campanulatis 6-flosculosis, pedunculis propriis nudis vel parvi- et raribracteatis, involucri 4-serialis phyllis extimis abbreviatis late subulatis reliquis majoribus oblongis obtusis acutisve intimis quam interiora longioribus necnon latioribus omnibus pallidis apice nigris, flosculis involucrum superantibus, achæniis cylindrico-turbinatis circa 8-costatis pubescentibus, pappi setis 2-serialibus exterioribus abbreviatis omnibus scabridis sordide albis vel substramineis.

Hab. Sani. No. 756. (Also Machakos; *Dr. S. L. Hinde* in Herb. Mus. Brit.)

Folia modice 3·0–4·0 cm. long., 0·7–1·5 cm. lat., in sicco læte virentia, subtus glandulis immersis numerosis prædita, firme membranacea; petioli 0·15 cm. long., ampli. Corymbus perfecte evolutus 10·0 cm. long. et diam. Pedunculi proprii 0·1–1·0 cm. long. Involucrum 0·5–0·65 cm. long.; phylla extima 0·15 cm., interiora circa 0·25 cm. long.; intima 0·5–0·6 cm. long. et 0·15 cm. lat. Corollæ extus papillosæ tubus et lobi 0·5 cm. long., hi humectati saturate cærulei. Achænia 0·2 cm., pappus 0·8 cm. long.

Allied to *V. myriocephala* Rich. and *V. Goetzeana* O. Hoffm., but differing from both in the small oblong leaves glabrous on both sides, and in many details of the involucre and florets.

Microglossa densiflora Hook. fil. Kikui. No. 1009.

Marsea Volkensii (*Conyza Volkensii* O. Hoffm.). Golunko. No. 851.

Sphæranthus suaveolens DC. Golunko and Kitui. Nos. 871, 991.

Helichrysum fœtidum DC. var. *microcephalum* Vatke. Gaditu. No. 875.

H. Kilimanjari Oliv. Gaditu. No. 878 (in part).

H. Kirkii Oliv. Gaditu. No. 878 (in part).

Sphacophyllum Buchwaldi O. Hoffm. Muka. No. 901.

S. Holstii O. Hoffm. Golunko. No. 826.

Aspilia asperifolia O. Hoffm. Golunko. No. 770.

Coreopsis Kilimandsharica O. Hoffm. Golunko. No. 870.

Senecio discifolius Oliv. Golunko. Nos. 839, 841, 844.

S. sarmentosus O. Hoffm. Golunko. No. 811.

S. subscandens Hochst. Muka. No. 928.

Crocodilodes Spekeanum O. Kuntze. Sani. No. 736.

Sonchus Bipontini Aschers. var. *pinnatifidus* Oliv. & Hiern. Gaditu. No. 888.

ACANTHACEÆ.—II.

Thunbergia sericea Burkill. Kikui. No. 1000.

Phaylopsis longifolia T. Thoms. Sani and Nairobi. Nos. 734, 958.

Blepharis ruwenzoriensis C. B. Clarke. Kikui. No. 1019.

Barleria Volkensii Lindau. Kikui. No. 990. Sani. No. 744.

Crossandra subacaulis C. B. Clarke. Muka. No. 921 Nairobi. No. 969.

Justicia betonicoides C. B. Clarke. Nairobi. No. 970.

J. uncinulata Oliv. Sani. No. 745.

Diapedium albicaule, sp. nov. Planta brunneo-glanduloso-pubescens caule erecto ramoso sursum folioso mox glabro et cortice albo obducto, foliis parvis ovatis obovatisve obtusissimis in petiolum brevissimum attenuatis, spicis ad apicem ramulorum paucis approximatis unifloris adjecto rudimento floris secundi, bracteis lineari-lanceolatis acutis vel obtusis, bracteolis calycis lobis similibus anguste lineari-lanceolatis acuminatis una cum bracteis glanduloso-pubescentibus, corollæ tubo piloso-pubescente haud inflato limbi labio postico integro, capsula ——.

Hab. Nairobi. No. 975.

Folia modice 0·8–1·5 cm. long., 0·6–0·8 cm. lat., membranacea; petioli 0·2 cm. long. Bracteæ 0·7–1·0 cm. long., inter se inæquales, majores adusque 0·35 cm. minores 0·2 cm. lat. Bracteolæ 0·6 cm.

Calycis lobi angustissime lineari-lanceolati, 0·55 cm. long. Corollæ tubus 0·8 cm. long.; limbi labium anticum 0·6 cm. long., lobi laterales vix 0·1 cm. long. et lat., lobus intermedius rotundatus circa 0·2 cm. long. et lat.; labium posticum antico æquilongum. Antherarum loculi inter se æquales, 0·1 cm. long. Pollinis grana normalia. Ovarium anguste ovoideum, glabrum, 0·12 cm. long.; stylus fere 1·3 cm. long., pilosiusculus.

A very distinct species, easily known by, *inter alia*, its white stem and dense glandular pubescence.

Hypoëstes antennifera S. Moore. Muka. Nos. 913, 914.

NOTES ON CAMBRIDGESHIRE PLANTS.

By Albert Hosking.

It is now forty-three years since the appearance of Professor Babington's *Flora of Cambridgeshire*, and it seems time that the collation of the scattered records which have been published since then should be undertaken; this, with some further field-work, would form sufficient material for a new edition. The late W. West, B.A., did much useful work in this direction; see his "Notes on Cambridgeshire Plants," published in this Journal for 1898, p. 246, and those of Mr. Arthur Bennett (Journ. Bot. 1899, p. 243).

The records in the following list rest on my personal observation unless otherwise stated. The numbers are those of the districts of the county as defined in the Flora. Plants new to the county are marked *. The nomenclature is that of the *London Catalogue of British Plants*, ed. 9.

My thanks are due to Mr. Arthur Bennett for kindly looking over some of the plants mentioned.

Ranunculus bulbosus L. A form with sulphur-coloured flowers. 1. Hills Road, three miles from Cambridge, June, 1897. It remains constant under cultivation in the Cambridge Botanic Garden.

**Neckeria lutea* Scop. 3. Old walls, Grantchester.

Sisymbrium officinale Scop. b. *leiocarpum* DC. 1. Trumpington Road. 3. Grantchester, 1901.

Brassica Erucastrum Vill. 1. Devil's Ditch, 1902, and since 1885. See Journ. Bot. 1894, 21.

**Diplotaxis muralis* D.C. b. *Babingtonii* Syme. 1. Railway bridge, Linton, 1901. Mr. Spencer H. Bickham and myself found this growing in the old brickwork of the bridge; we did not think it as typical as those to be found on the South Denes, Yarmouth, but Mr. Arthur Bennett considers it *D. Babingtonii*.

**Helianthemum Chamæcistus* Mill. var. *hirsutum* Koch (var. *villosum* Peterman). 1. Gogmagogs, 1901. Found by Mr. R. I. Lynch, A.L.S. It retains its distinctive character on the rockery in the Botanic Garden.

Polygala calcarea F. Schultz. 1. Gogmagogs, 1899. Mr. Fryer

has recorded this from 5. Chippenham Fen, 1889 (Journ. Bot. 1889, 119).

**Silene Cucubalus* Wibel. b. *puberula* Syme. 1. Gogmagogs. 2. Dernford Fen, 1898–1901.

Geranium pyrenaicum Burm. 1. Hills Road, near Gogmagogs, the only station I know, and always with white flowers; the pink-flowered form is naturalized in the Botanic Garden.

Lathyrus Aphaca L. 1. Cherryhinton, and near the Hills Road, 1902.

Sedum dasyphyllum L. 1. Roof-tops, Trumpington; Mr. R. I. Lynch rediscovered this plant in 1901; it is now in good quantity. It was recorded by Babington, 1857, "soon after which date the house was pulled down."

Drosera rotundifolia L. 5. Still grows in Chippenham Fen.

Epilobium angustifolium, L. 5. North-east end of Quy Fen, in good quantity, 1901. Mr. Fryer found it at Chatteris (Journ. Bot. 1886, 345).

E. hirsutum L. flore albo. 1. In the ditch, Cherryhinton Road, since 1895.

Siler trilobum Crantz. 1. Cherryhinton; still lingers at this station.

Selinum Carvifolia L. 5. Chippenham Fen; certainly spreading into the fen proper since I first saw it in 1895.

Adoxa Moschatellina L. 1. Plantation, Brooklands Avenue, Cambridge, in quantity.

Valerianella olitoria Poll. 3. Cornfield above Madingly Chalk-pit, 1898.

Erigeron canadense, L. 1. Cornfields, Hills Road; also near Trumpington Road.

Anagallis tenella L. 1. Hobson's Stream, Cambridge, in plenty. 5. Quy Fen.

Myosotis versicolor Reichb. 2. Sawston Moor.

Lycium chinense Mill. (*L. barbarum*, Lond. Cat. ed. 9) is common in districts 2 and 3. Mr. George Nicholson has shown (*Nature*, xv. 101 (1901)) that the *Lycium* which occurs in this country is *L. chinense*, and not *L. barbarum*.

Nepeta Glechoma Benth., flore roseo. 1. Roadside near Brinkley Wood; has kept true to colour since 1897 in the Botanic Garden.

**Galeopsis angustifolia* Ehrh. 1. Fleam Dyke and Devil's Ditch, 1895.

G. angustifolia Ehrh. var. *canescens* Schultz. 1. Fleam Dyke, Gogmagogs, &c. 5. Quy. According to Mr. Arthur Bennett (see Watson, Bot. Exchange Club Report, 1901) this is the correct name for the plant so common in our cornfields, the *G. Ladanum* of Babington's *Flora*.

Lamium purpureum L. flore albo. 2. Cultivated ground, Grantchester, 1898–1902. Babington in his diary records this white form from this locality in 1839. Can it have grown there continuously for over sixty years?

Myrica Gale L. 5. Wicken Fen; both male and female plants in good quantity at the north-east side, 1894–1901. Babington sup-

posed this plant to have been destroyed by drainage and cultivation, though formerly abundant in several localities. Mr. Fryer found it at Wimblington-in-the-Firelots, 1884 (Journ. Bot. 1899, 245).

INFECTION-POWERS OF ASCOSPORES IN ERYSIPHACEÆ.

By Ernest S. Salmon, F.L.S.

During the past months I have carried on a series of infection-experiments, using the ascospores of *Erysiphe Graminis* DC. on *Hordeum vulgare*. The experiments seem to show conclusively that the infection-powers of the ascospores, on which nothing has hitherto been known, are restricted in a definite manner. It is impossible to give here the full details of the experiments, of the behaviour of the ascospores in various media, the penetration of the germ-tube and the formation of the first haustorium, &c., and the object of this preliminary note will be to summarize the chief points of interest. In order to estimate the peculiar importance which the question of the infection-powers of the ascospores assumes in the life-history of the *Erysiphaceæ*, it is necessary to bear in mind certain biological facts which have been recently discovered in connection with these fungi. During the last year experiments carried on by several investigators have proved the existence of "biologic forms" of several species, in the conidial stage, of the *Erysiphaceæ*. These "biologic forms" of a species are morphologically identical, while differing physiologically or biologically, as is shown by the fact that they behave differently towards the same host-plant. Although the existence of such forms was suspected by some of the older mycologists (*cfr.* De Bary's (1) p. 384) * interesting remarks on the subject), definite experimental proof has only recently been given. Previously to this only vague and unsatisfactory statements existed; a critical summary of these will be found in my monograph and "Supplementary Notes" (2) (3). The first definite experimental proof of the existence of "biologic forms" was obtained by Neger (4), who proved that the forms of *Erysiphe Cichoracearum* on *Artemisia vulgaris*, *Hieracium murorum*, and *Senecio vulgaris*; the forms of *E. Polygoni* on *Heracleum Sphondylium* and *Trifolium incarnatum*; and the form of *E. Galeopsidis* on *Galeopsis Tetrahit* constituted in each case a "biologic form," the conidia being unable to infect various host-plants on which the species in question is found.

During last summer I was able, through the kindness of Prof. Marshall Ward, to carry on a series of experiments in the Botanical Laboratory at Cambridge. The results of these experiments will appear in a paper in the next number of the Beihefte of the *Botanisches Centralblatt* (now in the press). The fungus used in my experiments was the conidial (*Oidium*) stage of *Erysiphe Graminis* and *E. Polygoni*. Evidence was obtained of the existence of "biologic

* These numbers refer to the bibliography given at p. 165.

forms" of *E. Graminis* on *Bromus interruptus*, *B. hordeaceus*, *B. commutatus*, *B. tectorum*, and *B. arvensis*, *Triticum*, and *Avena*, and of *E. Polygoni* on *Trifolium pratense* and *Pisum*. Whilst these experiments were proceeding, a paper appeared by Marchal (5), giving the results of a number of infection-experiments in which the same fungus—the conidial stage of *E. Graminis*—had been used. The evidence obtained was considered by Marchal to prove the existence of seven "biologic forms," or "formes spécialisées." Among the number we find one characterized as follows:—"*E. Graminis*, f. spéc. *Hordei*, sur *Hordeum hexastichon, vulgare, trifurcatum, nudum, jubatum*, et *murinum*, non sur *H. maritimum, secalinum*, et *bulbosum*." This "forme spécialisée" *Hordei* proved to be unable to infect rye, wheat, or oats, or indeed any other species of grass on which it was sown in an experiment in which forty-eight species of grasses belonging to twenty-seven different genera were used.

Now in all these experiments the conidial stage only of the fungus has been used, and in considering the question of the distinctness of "biologic forms" in the *Erysiphaceæ*, one has been compelled, from the absence of any information on the subject, to leave out of consideration the infection-powers of the ascospores. It is obvious that the whole problem concerning the distinctness and significance of these conidial forms becomes altered and extended when we consider what may be the infection-powers of the ascospores of each form. Neger has expressed the opinion that it is probable that the ascospores serve as a connecting link between "biologic forms." Neger supposes that in the case of two "biologic forms" of *Oidium* growing on host-plants *x* and *y* (where the *Oidium* on *x* is unable to infect *y*, and *vice versa*), the ascospores of the fungus produced on either plant will prove capable of infecting the other. Neger cites as evidence in support of this view certain phenomena he has observed in the case of some species of *Erysiphe* on certain host-plants. He observes (4, p. 270): "Der Umstand aber, dass auf einjährigen Pflanzen, z. B. *Senecio vulgaris* (bei welchem also Mycel-überwinterung ausgeschlossen ist), eine *Erysiphe* sich in jedem Jahr reichlich entwickelt, ohne indessen je zur Perithecienbildung zu gelangen, legt die Vermuthung nahe, dass mittelst der Ascosporen die Uebertragung eines Mehlthaupilzes von einer Art auf eine andere (Wirthpflanze) wohl möglich ist. *Demnach wären die Ascosporen dadurch ausgezeichnet, dass sie das Bestreben zeigen, den Kreis der Wirthpflanzen eines Pilzes weit zu erhalten, während die Conidien sich sehr schnell einem bestimmten Substrat anpassen.*" With regard to the phenomena quoted I have elsewhere given reasons for considering that the deductions drawn by Neger are hardly warranted. On *a priori* grounds, however, it certainly seemed likely that the ascospores might prove to be able to infect host-plants of the species which the conidia of "biologic forms" were unable to do. Marchal, however, it may be noted, inclines to the opposite opinion. This author remarks (5, p. 212), in connection with the "biologic forms" of *E. Graminis* studied by him: "Comment se comportent les ascospores des diverses races physiologiques étudiées? Contribuent-elles à fixer d'une façon plus profonde, définitive, dans la descendance, l'étroite adaptation parasitaire acquise? Ou bien

permettent-elles, ce qui est moins probable, à l'*Erysiphe Graminis* d'étendre son aire de dispersion sur d'autres hôtes ?"

Before giving the results of my experiments with the ascospores of *E. Graminis*, a few remarks may be made on the method employed of obtaining the ripe ascospores, and of inoculating the plants. The material used was collected at Cambridge last August, and consisted of dead leaves of barley bearing perithecia. The leaves were kept dry in a box during the winter months. As is well known, the asci of *E. Graminis* in the autumn and throughout the winter contain, as a rule, only a mass of granular protoplasm, and show no trace of the formation of ascospores. This was found to be the case with the asci when examined last March. The production of ascopores may, however, be at once induced by supplying the fungus with moisture. Dead barley leaves bearing perithecia were placed in a Petri dish lined with wet filter-paper, enough water being added to produce a film over the surface. Under these conditions, in a temperature of about 18°, the protoplasm of the ascus at once resumes its activity, and changes take place which result in the formation of four, six, or eight ascospores. The whole process is completed in three to five, usually four, days, by which time ripe ascospores are produced. Two interesting facts were observed at the time of the maturity of the asci, *viz.* the regular dehiscence of the perithecium and the ejection of the ascospores. It was found that the perithecium spontaneously opened ; the ascospores were forcibly ejected into the air, and were found germinating in the drops of water condensed on the cover of the Petri dish, at a distance of 2 cm. from the perithecium. The experiment was repeated again and again, with invariably the same result. The process of this dehiscence and the ejection of the ascospores was closely followed, and the following details observed. Numerous leaves bearing perithecia were placed on wet filter-paper, as described above, on the bottom of a Petri dish ; on the fourth day a few of the perithecia had spontaneously opened, and ascospores had been thrown up to the top of the Petri dish, where they had commenced germinating. On the fifth day many hundreds of spores were thus thrown up, and by the sixth day all the drops of water condensed on the cover were sown with thousands of ascospores. The spores were often found in little groups, suggesting that they had been ejected all together from the ascus, as is the case in *Ascobolus*, &c. The dry perithecium of *E. Graminis* is usually concavo-convex, but on absorbing moisture it becomes biconvex. It opens by a horizontal slit, somewhere about the equatorial plane, at one side. The slit gradually extends further and further round, while the upper half of the perithecium, like a lid, becomes lifted up. This circumscissile dehiscence sometimes results in the upper convex half of the perithecium falling away, and the lower exposed and now more or less empty basal half remains fixed in the pannose mycelium. The actual dehiscence is in all probability brought about by the swelling of the mucilaginous cells of the inner wall of the perithecium. De Bary (1, p. 399) had observed that the cells of the inner wall become mucilaginous in

water, and Harper (6) later has remarked, with regard to *Sphærotheca Castagnei* and *Erysiphe communis*: "Die Zellen der Innenwand behalten noch in sehr alten Fruchtkörpern ihren protoplasmatischen Inhalt und ihre Kerne. . . Es ist nicht unmöglich, dass ihr Inhalt endlich eine quellbare Substanz erzeugt, welche das Zersprengen der Perithecien zur Zeit der Entleerung der Ascen vermittelt."

The bursting of the perithecium and the ejection of the ascospores of *E. Graminis* were recorded as far back as 1884 by Worthington Smith (7), but the observations here published have been generally overlooked. This author recorded that if old grass or straw infected with *Erysiphe* is kept in damp air under a bell-glass, and strips of glass smeared with glycerine are suspended over the infected leaves, it will be found that the asci and ascospores will be ejected on to them from the perithecia.

The little that has been hitherto known on the subject of the germination of the ascospores will be found given in my monograph, &c. (2, pp. 9, 104), (3, p. 20). Wolff (8) has published a few observations on the germination of the ascospores of *E. Graminis*, and of the infection of the leaf of a wheat-plant by a germinating ascospore. The same author also makes the following interesting statement, but no details are given of any of the experiments:—"Was nun die verschiedenen Nährpflanzen der *E. Graminis* betrifft, so fand ich dieselbe auf Weizen, von denen nach Infektionsversuchen englische und gewöhnliche Sorten, Sommer- und Wintervarietäten einen geeigneten Boden für sie abgeben; ein Gleiches war bei Roggen und Gerste der Fall; durchaus nie fand ich sie, und missglückte jeder Kulturversuch auf Hafervarietäten."

The object of my experiments was to ascertain what were the infection-powers of the ascospores of the form of *E. Graminis* occurring on barley, which, as mentioned above, has been proved by Marchal to constitute in the conidial stage a sharply defined "biologic form." The following method of inoculation was used in all the experiments. At the time when the perithecia were ejecting their spores, unopened perithecia were taken and crushed with a blunt needle in a large drop of distilled water on a glass slide. After about a hundred perithecia had been thus treated, the glass slide with its drop of water containing the ascospores was suspended upside down for a few minutes. The leaf about to be inoculated was rubbed between fingers moistened with distilled water, so as to give a damp surface to the leaf, and the drop of water was then transferred to the moist surface of the leaf. Three or four leaves were inoculated in each pot, the remainder of the leaves, about ten, serving as controls. Directly after inoculation the pot was covered over with a glass beaker lined with damp filter-paper. After twenty-four hours the beaker was raised to the level of the top of the pot, and then after another twenty-four or forty-eight hours entirely removed. The plants were kept in a greenhouse in a temperature of 16–20° C.

In the first experiment (Exper. no. 1) ascospores were sown on seedling plants (eight days old) of oats, wheat, and rye. No infection was visible after four weeks.

In the next experiment (Exper. no. 3) ascospores were sown on March 31st, on barley and rye. Seedling plants were used, twelve days old. Three leaves of the barley were inoculated. On April 7th two of the inoculated leaves bore each a patch of mycelium with young conidiophores; on one control leaf there was also a similar patch. On April 11th patches of mycelium on all the inoculated leaves bore a densely crowded mass of conidiophores, with ripe masses of conidia. By April 13th these *Oidium* patches bore powdery masses of spores, and secondary infection was taking place on several of the young leaves which had appeared during the course of the experiment, and which now bore minute flecks of mycelium. Two leaves of the rye were inoculated, but neither these nor any of the control leaves showed any signs of infection throughout the experiment.

In the next experiment (Exper. no. 4), on the same date, seedlings twelve days old of wheat, barley, and oats were inoculated—three leaves in each case. With regard to the barley, one inoculated leaf bore, on April 6th, a small patch of mycelial hyphæ. On April 7th two of the inoculated leaves bore minute flecks of mycelium, in one case with a group of young conidiophores. A patch of mycelium with young conidiophores was observed on one of the control leaves which was close to the inoculated leaves, and may have rubbed against it. On April 8th two of the inoculated leaves bore each a patch of mycelium with groups of young conidiophores; on the third inoculated leaf a small patch of mycelial hyphæ had appeared. On April 11th two of the inoculated leaves bore each a patch of *Oidium* with dense powdery masses of spores, and one bore also another smaller patch of mycelium with nearly ripe conidiophores. On both these leaves the *Oidium* occurred only just where the ascospores had been sown. The third inoculated leaf bore a patch of mycelium with young conidiophores. The patch of mycelium on the one control leaf now bore a powdery mass of spores. On April 16th all the inoculated leaves bore numerous patches of *Oidium* with very powdery masses of spores, which dispersed in a cloud on the leaves being touched. No trace of any infection appeared on the wheat and barley during the course of the experiment.

In Exper. no. 5 ascospores were again sown, on April 1st, on seedlings of barley and wheat (thirteen days old) and of rye (twenty-one days old). Three leaves were inoculated in each case. With regard to the barley, on April 6th a small fleck of mycelial hyphæ was observable on one of the inoculated leaves. On April 7th two of the inoculated leaves bore each a fleck of mycelium with a few young conidiophores; one control leaf also bore a fleck of mycelial hyphæ. On April 11th all the three inoculated leaves were clearly infected; one leaf bore two patches, one with a powdery mass of spores which fell off in a cloud on the leaf being touched, the second leaf bore two patches, both with powdery masses of spores, and the third leaf a small patch of mycelium with groups of young conidiophores. On April 16th all the three infected leaves bore each 2–3 *Oidium* patches with powdery masses of conidia. The fully ripe or old conidia, seen in the mass, were of a pale rosy tinge.

Two control leaves, of twelve, bore small *Oidium* patches with a powdery mass of spores. No trace of infection occurred on any of the plants of the wheat or rye.

In the foregoing experiments it appeared almost certain that the infection of the control leaves of the barley was due to the inoculated ones, in the rapid growth of these young seedlings, brushing against them when the plants were confined in the glass beakers. In such circumstances the ascospores contained in the drops of moisture standing on the inoculated leaves would fall on to the control leaf brushing against it. To obviate the possibility of such occurrences, in the next experiment (Exper. no. 6) ascospores were sown, on April 2nd, on three leaves, well separated from the others in the pot, of barley and rye. Ventilation was given after twenty-four hours by raising the beaker by blocks to the level of the top of the pot; the plants were kept thus covered by the beaker until April 7th. On this date two of the inoculated leaves bore minute flecks of mycelium, in one case originating exactly from the spot where inoculation had been made, marked by the remains of the crushed perithecia. On April 8th all three leaves were clearly infected; one leaf bore a patch of mycelial hyphæ at the exact place of inoculation; the second leaf bore three small mycelial patches, one round an isolated crushed perithecium; the third had a minute patch of mycelium bearing a few very young conidiophores. All the control leaves, eight in number, were quite free. On April 11th one leaf bore three patches, all with nearly ripe conidiophores; the second leaf bore three patches, one of which was so ripe that the conidia fell off in little clouds; the third bore five patches, all with ripe powdery masses of conidia;—all the controls still free. On April 16th the *Oidium* patches on the three inoculated leaves all bore such powdery masses that clouds of ripe conidia flew off on the pots being touched. Two small flecks of mycelium were visible on two young leaves of the control plants, doubtless due to infection from the conidia. No trace of infection occurred on the rye.

In Exper. no. 7 (April 3) no special precautions against the rubbing together of the inoculated and uninoculated leaves were taken. Four leaves of barley and three of oats were inoculated, seedlings fifteen days old being used. With regard to the barley, two small patches of mycelial hyphæ were observed on one of the inoculated leaves on April 8th. On April 9th the second inoculated leaf bore five small flecks of mycelium, two of which were producing groups of young conidiophores. On April 11th the patches on the inoculated leaves bore powdery masses of spores; one control leaf was observed with a small patch of mycelium bearing a powdery mass of spores. On April 13th two of the inoculated leaves bore each two patches of mycelium with powdery masses of spores; the third inoculated leaf bore also two very powdery patches, one measuring 6 × 4 mill.; two control leaves bore patches of mycelium with powdery masses of spores. On April 16th all of the four inoculated leaves were infected, and bore *Oidium* patches with powdery masses of spores. No trace of any infection appeared on the oats during the course of the experiment.

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(To be concluded.)

POTAMOGETON PRÆLONGUS Wulf. IN BRITAIN.

By Arthur Bennett, F.L.S.

This species was first published as a British plant in Hooker's *British Flora*, ed. 3, 77 (1835); but it had been gathered many years before, and passed as *lucens*. Specimens from Moray in the Brodie Herbarium dated back to before 1820 (see A. Murray, *Northern Flora*, 108, 1836). It was first determined from specimens gathered by J. B. Buchan, who sent it to W. A. Stables, by whom it was passed on to G. A. Walker-Arnott, who named it in 1833 (see *Phytologist*, i. 237, 1842). It had also been gathered in Cromar, Aberdeenshire, by Murray, "several years before, and shown by him to Mr. J. Anderson."

In *Comp. Cyb. Brit.* p. 344 (1869), Mr. Watson says "low grounds" (*i. e.* 500 ft. or below), yet he records it in the *Cybele* as gathered in Yorkshire at "about 1200 ft." Since 1869 many new records and altitudes have been published, of which the following is a selection:—Argyle, 607, *Macvicar*, sp.; York, 1250 ft., *J. Windsor* in herb. C. Bailey!; Westmoreland, 1550 ft., *Baker*, Lake Fl. 208 (1885); Aberdeen, Banff, and Kincardine, 600 to 1600 ft.? *Dickie*, Bot. Guide, 177 (1860); Perth, Mid., 2500 ft., *Macvicar*, sp.; 2500–3000 ft., *Messrs. Dixon and Valance*, "Pool near summit of Ptarmigan," sp.:—I suppose Meall nan Tarmachan (3421 ft. according to Mr. Munro) is intended (see Scott, Mount. Club Journal, 282 (1891), "1250 ft. in Highland Isla to 1900 ft. in Rannoch, *Buchanan White*, Fl. Perth." The authors of the *Cybele Hibernica*, ed. 2, 377 (1898), say "Lowland."

In Europe the following may be given :—

France: Doubs, 1733 to 2697 ft.; Jura, 3534 to 3816 ft., *Magnin*, with specimens from each elevation. Switzerland: Bettensee, Upper Valais, 6500 ft., *Marshall*, sp. *P. prælongus* is capable of bearing greater cold than *lucens*, as I have proved by actual experiment in an open iron tank. In Europe it extends northwards to Swedish Lapland, 68° 5′, *Læstadius*; Arctic Norway, 69° 56′, *Norman*; Finnish Lapland, 66° 55′, 67° 12′, 67° 49′, *Wainio*, Act. Soc. fenn. viii. n. 4, 71 (1891); Russian Lapland, above 68°, *Hjelt*, Fl. Fenn. 528. It was reported to Hjelt by Enwald as occurring in Lapponia inarensis, and Lapponia tulomensis, between 68° and 69° 50′. In Finland *lucens* is not recorded north of 67° 10′, *Hjelt, l. c.* *Prælongus* is not on record for Greenland or Iceland, but occurs in the Faroes!

In Britain it occurs in Shetland (*Beeby*, sp., 1887), Caithness (*Grant*, sp.), and Sutherland (*Marshall*, sp.); and beyond the records in *Top. Bot.* ed. 2, I have notes or specimens for eighteen other counties. There is a specimen in Clifford's herbarium under the name of "P. aquis immersus, folio pellucido, lato, oblongo, acuto;" "lucens" has been added by another hand. Smith (Engl. Flora) gives this under *lucens*, referring to *Raii Syn.* 148 (1724); Hudson and others do the same.

The species has not had many named varieties; the following may be mentioned :—

Var. foliis angustioribus Hook. Brit. Fl. ed. 3, 77 (1835).

Var. *latifolius* Alpers in herb. Buchenau.

Var. *brevifolius* Célak. Sitz. Boh. Gew. Wiss. 36 (1886),

f. *elegans* Tiselius, Pot. suec. exsicc. No. 85 (1885), which is a long (twelve inches) pellucid-leaved form.

The following hybrids are assigned to it :—

P. prælongus × *crispus* Caspary, sp.

P. prælongus × *gramineus* Asch. & Graeb. Fl. Mitt. Europ. i. 330 (1897).

P. prælongus × *perfoliatus* Ar. Benn. in Journ. Bot. 1894, 153. This is not the same as *P. cognatus* Asch. & Grab., *l. c.*, though so considered by these authors. The American plant named by me *prælongus* × *perfoliatus* may therefore bear the name × *P. intermixtus*.

P. lucens × *prælongus* = × *P. Babingtonii*, Ar. Benn. in Journ. Bot. 1894, 204.

P. alpinus × *prælongus* according to Asch. & Grab., *l. c.* 317. "= *P. Griffithii* Ar. Benn." This conclusion I cannot accept; my opinion is based upon long cultivation of the plants side by side.

There is another possible hybrid—*prælongus* × *heterophyllus graminifolius*,—but the evidence is not sufficient at present.

The original specimens of Wulfen were gathered "in fluvio Szthiza, June, 1763," Herb. Vienna!

SHORT NOTES.

The Arran Isle Pyrus.—In his monograph of the genus *Sorbus*, Dr. Hedlund (Kon. Sv. Veten. Akad. Handl. p. 60, 1901–2) raises the puzzling form from Arran to the rank of a species, as *Sorbus arranensis*. This does not seem to agree with Prof. Koehne's view (Journ. Bot. 1897, p. 99) that all the Arran plants are hybrids between *Aria suecica* Koehne and *Sorbus Aucuparia*. Mr. Ley's *Pyrus minima* becomes *Sorbus minima* Hedlund, and he retains it as a species. So far as the Arran plant is concerned he seems to have seen little material. Some years ago Mr. G. Nicholson collected an excellent series of the plant, and many of us were indebted to him for a series of specimens. Perhaps the true rank of these forms must await cultivation in some botanic garden.—Arthur Bennett.

Scheuchzeria palustris.—An additional v.-c. and station for this decreasing species seems indicated by the specimens in Don's "Herbarium Britannicum, No. 208," *i. e.* "Marsh near Wetherby, Rev. J. Dalton"; this is in co. 64, Mid-west Yorkshire. This goes towards a confirmation of Mr. Leighton's note in this Journal for 1866 (p. 306), *i. e.* "First discovered in England in 1787, at Lakeby Carr, near Boroughbridge, Yorkshire, by the Rev. James Dalton." That it was found before 1807 is certain from this specimen in Don; his four fasciculi of twenty-five plants yearly were published from 1804 to 1806. *Scheuchzeria* is No. 208; this would bring it to the early part of 1806, and it was doubtless gathered at least in the year before. It is certain that he was at Lakeby Carr in 1790, as Mr. Wilkinson tells me there are specimens of other plants so localized and dated in the York Philosophical Society's Herbarium. The dates of the specimens of *Scheuchzeria* from Lakeby Carr in that herbarium are 1807, 1822, 1823, 1839, 1870. Mr. Leighton remarks (Fl. Shropsh. 156), "It seems singular that the plant, which is in some abundance, should have escaped the observation of the accurate Rev. E. Williams," as it did not appear in his MS. list of Salopian plants. It was discovered in Shropshire in 1824. The "some abundance" is now a thing of the past at Bomere, though it may still exist at Mr. Beckwith's station: "In the summer of 1881 Mr. La Touche and I could only find a few plants on the mossy margin of Bomere Pool" (Journ. Bot. 1882, 366). In Perthshire careful and repeated search for it has been in vain. In this Journal for 1898 (p. 381), I mentioned I had not heard of its recent occurrence in Cheshire, but I overlooked the Rev. E. S. Marshall's record, *l. c.* 1896, 136. —Arthur Bennett.

Ricciocarpus natans (p. 139).—Mr. Bagnall's note reminds me that I collected this species (and have specimens in my herbarium) from a pool near Little Baddow, Essex, on Sept. 14th, 1881. It may be worth while putting this on record. I also collected it in Cambridgeshire in 1882.—H. N. Dixon.

Asplenium germanicum Weiss.—In looking over a small collection of plants from the herbarium of J. E. Winterbottom, I noted an example of this species labelled "Granitic rocks, Black Forest.

Mr. [J. E.] Bowman. Oct. 1833." This fern, of which Newman remarks, "One of the rarest—perhaps the very rarest—of our British ferns," is mentioned for seven vice-counties in Watson's Top. Bot. as under:—"49. Carnarvon. 68. Cheviotland. 70. Cumberland. 80. Roxburgh. 83. Edinburgh ? 85. Fife. 89. Perth East. [Supposed error. 5. Somerset South.]" As regards v.-c. 83 Edinburgh, queried by Watson, specimens exist in Herb. Brit. Mus., labelled "Blackford Hill near Edinburgh. Dr. Inglis," and at Kew, labelled, "Gathered within two miles of Edinburgh. P. N. Fraser. 1857" (Herb. A. G. More). The Rev. R. P. Murray's *Flora of Somerset* (1896) does not include *A. germanicum*, but examples from that county (v.-c. 5) exist in the collections at Kew from both Oare and Culbone. The only *dated* specimen is labelled "On a stone wall near Oare, in the parish of Culbone, on the borders of Devonshire and Somersetshire. 1840. Ex herb. N. B. Ward." The following vice-counties may also be added to the above:—42. Brecon! J. E. Bowman in herb. J. E. Winter-bottom.—48. Merioneth. J. F. Pickard, sp. (*fide* A. Bennett).—? 50. Denbigh. Near Llanrwst. Mr. H. Wilson (T. Moore's *Ferns of Great Britain and Ireland*). This may be in Carnarvonshire, as Llanrwst is close to the border.—69. Westmoreland. Found in Little Langdale, by J. Coward, in 1853 (J. G. Baker's *Flora of Lake District*). This may be in that part of Lancashire included by Watson in v.-c. 69, as Little Langdale separates the two counties. 69 or 70. Westmoreland; Cumberland. Helvellyn. Rev. W. H. Hawker (T. Moore, *l. c.*). In one or other of these counties; Helvellyn stands on the parting line.—C. E. Salmon.

NOTICES OF BOOKS.

Recent Physiology.

The Influence of Light and Darkness upon Growth and Development. By Daniel Trembly Macdougal, Ph.D. Memoirs of the New York Botanical Garden. Vol. ii., large 8vo, pp. xiii, 319, tt. 176. Jan. 20, 1903.

On the Physics and Physiology of Protoplasmic Streaming in Plants. By Alfred J. Ewart, D.Sc., Ph.D., F.L.S. Royal 8vo, pp. viii, 131, tt. 17. Clarendon Press, Oxford. 1903. Price 8/6 net.

The recently issued volume of the Memoirs of the New York Botanic Garden forms a valuable addition to the literature of plant physiology. It contains the results of experimental work extending over seven years, and including observations on a large variety of plants. Ninety-seven species have been cultivated in continuous darkness, control plants having been grown under conditions otherwise the same but in ordinary alternation of light and darkness. The subjects of experiment include aquatics, creepers, climbers, succulent plants, mycorhizal forms, geophilous and aërial shoots, mesophytes and spiny xerophytes, and were grown from tubers,

corms, rhizomes, cuttings of leaves and stems, seeds, and spores. The later work was carried on in a specially built dark chamber, entrance to which was gained by double doors, so arranged that no daylight was admitted; the plants were examined by aid of the light of a candle or a small electric hand-lamp.

In pages 1–35, Dr. Macdougal gives a useful historical account which includes notices of nearly all of the more important researches bearing upon the subject, from Ray and Hales onward to the beginning of the present century.

The remainder of the first two hundred pages contains a detailed account of the author's experiments on nearly one hundred different species. The arrangement is an alphabetical one, under the name of the plant which formed the subject of experiment. As the nomenclature is neo-American, the English plant physiologist will perhaps fail to recognize well-known plants under such strange names as *Apios Apios* Macm., *Bicuculla Cucullaria* Millsp., *Hypopitys Hypopitys* Small, or *Vagnera stellata* Morong. It would have been kind if the author, having salved his conscience by use of the new name, had also included the Linnean name and given a cross reference in his table of contents.

The chapter on "General Considerations," which follows, supplies a useful correlation of the results based on the experiments, details of which have been given in the preceding pages, and includes also critical remarks on work of other observers: the general student of botany will find this chapter a helpful one. The remaining pages of the text, 280–309, comprise several short chapters. "Theories as to the Nature of Etiolation" is a brief *résumé* of explanations advanced by previous workers. "Morphogenic Influence of Light and Darkness" follows. Examination of the facts obtained by absolute etiolations shows that no one of the theories recorded in the preceding section is capable of general application to the behaviour of all plants in darkness. "The phenomena of etiolation rest upon, and consist in, the behaviour of the plant consequent upon the absence of the morphogenetic influence of light. Some species show an adaptation to this absence of light, or to the positive influence of darkness, by which the shoots or petioles are elongated in such manner as to constitute an effort to escape from darkness, or to attain illumination." There are also chapters on the "Influence of Etiolation upon Chemical Composition" and "The Rate and Mode of Growth as affected by Light and Darkness."

The experimental part of the work is admirably illustrated by numerous drawings from nature, from photographs, and from microscopic sections.

Dr. Ewart's work on protoplasmic streaming formed the subject of a paper read early last year before the Royal Society, by whose aid the author has been enabled to publish it in the form of a separate treatise. It embodies the results of a series of observations carried on at Leipzig, Oxford, and Birmingham between 1894 and 1902. The subject matter is arranged under two headings—"Physics and Chemistry," comprising a discussion of those pheno-

mena of protoplasmic movement which can be directly referred to physical and chemical causes; and "Physiology," under which the author deals with those so-called vital phenomena for which it has not hitherto been possible to find a physical or chemical explanation. Under the second head are considered the relations between streaming, assimilation, and also growth, the influence of the nucleus, and the effect of various external stimuli on the process.

The author concludes that the energy of movement is generated in the moving layers themselves, which are retarded by friction against the non-moving ectoplasm, and also, but to a much less extent, by friction against the cell sap. The velocity of streaming is largely dependent upon the viscosity of the protoplasm, and therefore also upon the percentage of water in the latter, but osmotic pressure has little or no direct influence upon the process. Gravity exercises little or no influence upon streaming in small cells, and only a very slight effect in the case of large cells; but the velocity of floating particles of greater or less density than the plasma may be distinctly affected by gravity. A calculation of the amount of work done indicates that the energy expended in streaming is only a very small fraction of that produced by respiration. The force required increases enormously as the diameter of the channel decreases, so that streaming or transference in mass of the highly viscous ectoplasm through interprotoplasmic connections becomes practically impossible. The relations between streaming, growth, and assimilation are indirect; and similarly the influence of the nucleus is an indirect one. The minimal, optimal, and maximal temperatures for the process vary with the plant or cell examined, and also depend upon (1) the age or condition of the subject of experiment; (2) the external medium; (3) the duration of the exposure; (4) the supply of oxygen; and (5) the rapidity with which the temperature is raised or lowered. Strong light retards streaming, while weak light may indirectly accelerate the process in chlorophyll-containing cells. Acids, alkalies, and metallic poisons all retard the process, and may cause a temporary shock-stoppage when suddenly applied. Dilute alcohols and anæsthetics and weak electrical currents may accelerate the process; more concentrated solutions and strong currents retard it. The chloroplasts have no active power of movement, but are carried passively in the stream.

Finally surface-tension energy seems the only kind of energy capable of producing the streaming movements under the existing conditions in plant-cells; this is probably brought into play by the action of electric currents traversing the moving layers, and maintained by chemical action in the substance of the protoplasm. Such currents may be supposed to act upon regularly arranged bipolar particles of protoplasm in such a way as to lower the surface-tension on the anterior faces and raise it on the posterior ones.

An appendix on the electrical conductivity of egg albumin was not included in the original paper.

A. B. R.

Variation in Animals and Plants. By H. M. Vernon, M.A., M.D. International Scientific Series, vol. lxxxviii. Pp. 415, 5 figures and 25 diagrams. 1903. Price 5s. Kegan Paul & Co.

When Darwin was elaborating the theories of Origin and Descent, he recognized the import of many problems bearing on the co-ordinated facts from which the broad principles of his conclusions were derived. While regarding such problems as ancillary or even as subsidiary to the main issues, he anticipated that, in the specialized investigations pursued by those who applied the general principles implied by the acceptance of the theory of Evolution (as a working hypothesis) to the elucidation of the contributory factors, which were collaterally involved, more light would be shed on the causes of the diverse influences which not only favour continuous variation but also check it. Such, indeed, has happened. Neo-Lamarckism, Weismannism, Panmixia, and Genepistasis are examples of the labels which have been attached to the formulated expression of those biological phenomena which have been thought to modify the axial idea of Evolution, even if they have not sometimes obscured it. Mr. Bateson's *Materials for the Study of Variation* was the precursor of many essays, dealing with the factors of organic evolution, in which distinct lines of investigation have been followed up; and it succeeded in drawing attention to the important work which had been done in Germany, with the general acceptance and ready assimilation of Darwin's conclusions.

The latest addition to the "International Scientific Series" will enhance the interest of the set of volumes, devoted to the exposition of many aspects of recent science, inaugurated several years ago with Tyndall's *Forms of Water*. The author gives an account of the subject of Variation, in a well-digested summary of recent investigations, leading from the facts of Variation up to the causes, and the apparent laws which govern them, proceeding then to discuss Variation in its relation to Evolution. No apology is needed for contributing to the interest of the volume by including the author's own researches. The incorporation of the results of a series of investigations, specially bearing on the subject, and free from dogmatic inferences, even in an ordinary text-book, adds considerably to its value; the more so when no previous work exactly covers the same ground.

In the lull in controversy, and the passive but discriminating acquiescence, which followed Darwin's later works, the danger of a lethargic anticlimax was averted, strange to say, by the mathematicians, who, by exact measurements, and the analysis of facts by statistical methods, introduced a hitherto unapplied factor into the study of bionomics; which the biologist, with faculties less attuned to the refinements of precision, had either overlooked or neglected to appreciate at its proper value. To Mr. Francis Galton and Prof. Karl Pearson belongs the credit of insisting on the importance of meristic as distinguished from substantive variation. Dr. Vernon is considerate enough to dispense with algebraical formulas of the higher mathematics in expressing the co-ordinating

facts of Variation, and the reader will be grateful for a non-mathematical paraphrase of some of Prof. Pearson's arguments. The recent disinterring of Mendel's contributions to the study of the question, based to a great extent on his researches into the characters of hybrids, receives from the author its due meed of recognition, who does not profess to treat the botanical side of his subject with the same fullness which he bestows on the zoological portion. Correns and De Vries repeated Mendel's experiments, not always with similar results. Amongst the genera experimented upon were species of *Hieracium*, *Pisum*, *Mathiola*, *Cirsium*, *Achillea*, and *Carex*. Correns seems to conclude that the domination of a character shows itself only in crosses between varieties; whilst the hybrids of true species show the characters of both species, though in diminishing degree.

In discussing adaptive variations, the author points out that Darwin believed that variations are, as a rule, indefinite, and only exceptionally definite. Darwin did not, however, state the matter with his usual clearness. Henslow, on the other hand, from less logical premises, says that in nature variations are always definite. Unless such variations are governed by the laws of chance (if, indeed, chance has laws), Henslow's conclusions do not seem to be justified. If then the term "definite," as applied to variations, is regarded as more or less synonymous with "adaptive," then with the help of Lloyd Morgan's definition of determinate or definite variations as "variations along special or particular lines of adaptation," the discussion of their definiteness or indefiniteness, for practical purposes, is narrowed down. In spite of all that has been written to account for the almost universally present adaptation which is seen in animate nature, there is still a lingering doubt in the minds of philosophical biologists as to the entire adequacy of the explanations hitherto offered. Mr. Herbert Spencer, and others in this country, have maintained the inadequacy of Natural Selection to explain changes of structure which do not aid life in important ways, and have combated the views of Weismann, who, in a most able work, essays to show that the inheritance of acquired characters is a will-o'-the-wisp. Mr. Spencer even goes so far as to say that either there *has* been inheritance of acquired characters, or there has been *no* evolution.

Natural Selection, or survival of the fittest, as operative throughout the vegetal kingdom and throughout the lower animal kingdom, is characterized by relative passivity. But with the ascent to higher types of animals, its effects are in increasing degrees involved with those produced by inheritance of acquired characters; until, in animals of complex structures, inheritance of acquired characters becomes an important, if not the main, cause of evolution. Weismann, unlike Eimer in his *Factors of Organic Evolution*, seems to disregard the conclusion warranted by one of the methods of inductive logic, known as the method of concomitant variations. Dr. Vernon is not biassed in the matter, but rather avoids the issue by seeking some *via media* for extracting the more reasonable evidence from both points of view. This seems the only weak

point of the book; but it must be admitted that, in the present uncertain temper of the biosophists, this is just the question which the most experienced fencer in polemical dialectics would be most disposed to shelve.

The cuts are chiefly diagrammatic in character. The index of authors cited is a full one; the index of subjects is useful and carefully prepared; and the text seems to be free from misprints.

FREDERIC N. WILLIAMS.

Traité de Sylviculture: Principales Essences forestières. By P. MOUILLEFERT. Paris: Felix Alcan. Price 7 fr.

IN this volume of over five hundred pages M. Mouillefert, who has been for more than a quarter of a century Professor of Sylviculture at the National School of Agriculture at Grignon, gives us the first quarter of what promises to be an important work. His professed object is the popularization of forestry, and, whilst the present volume deals mainly with the description of the chief species of forest trees, the three others, which are promised in the course of the present year, are to deal with exploitation, measurement and valuation, and afforestation and re-afforestation. Some thirty-four pages at the beginning are devoted to French forest statistics, the discussion of the influence of forests upon rainfall and climate, and the conditions of forest production. The description of the species is preceded also by some definitions, of which it may be interesting to quote three of the most disputable:—

"Sélection naturelle.—C'est la force qui tend à faire développer chez les individus les caractères propres au milieu où ils vivent.

"Concurrence vitale.—C'est le combat perpétuel que tous les êtres vivants se livrent entre eux pour l'existence.

"Hérédité.—La force qui tend à fixer chez les individus les caractères acquis chez leurs parents."

The species dealt with are classified into indigenous broad-leaved trees, resinous trees, underwoods, and commonly cultivated exotic species, the first group being again subdivided into hardwoods, woods of inferior hardness, fruit-trees, and whitewoods. Each is described as to dimensions, habit, botanical characters, history, geography, environment, propagation, and wood, the physical characters, structure, uses, and fuel-value of the latter being fully discussed. A synoptical table is also given of about seventy of the commoner woods, grouped according to structure. Some account is also given under each genus of its chief insect and fungal enemies. The scale upon which the work is carried out may be gauged from the fact that the account of the oaks occupies seventy pages. M. J. Mouillefert has furnished 630 excellent drawings, chiefly of structural details, giving not only foliage, floral organs, and fruit, but also sections of wood magnified twenty times. These last are not very satisfactorily reproduced. The spelling of the scientific names and the use of capitals in the legends of these illustrations have not been properly revised, so that we have "Quercus Pedonculata, Castanea verea, Carpinus betulus, Ulmus

Pedunculata, Fraxinus ornus, Acer Campestra, Betula vernicosa." In an elementary work of this character we doubt whether it is desirable to refer to views of morphology generally considered as heresies, such as Baillon's on the ovule of Gymnosperms, and there seems to be a slight error in the punctuation of the note dealing with this topic on p. 328. It stands thus :—" Cette théorie de la *Gymnospermie* n'est pas admise par tous les botanistes ; c'est ainsi que ces végétaux sont au contraire considérés par H. Baillon comme ayant un ovule orthotrope ou plus ou moins renversé. Ordinairement réduit au nucelle et entouré d'un sac qui est un ovaire formé de 2 feuilles carpellaires." These are, however, but trifling matters in a generally excellent work.

G. S. B.

BOOK-NOTES, NEWS, &c.

At the meeting of the Linnean Society on 19th March, Mr. Clement Reid exhibited drawings by Mrs. Reid of fruits and seeds of British preglacial and interglacial plants (Thalamifloræ). In each case the specimens illustrated were the earliest known representatives of the species. Most of the plants are still living in Britain ; but among the Thalamifloræ from the Cromer Forest-bed occur seeds of *Hypecoum*, a genus specially characteristic of the Mediterranean region, and no longer found living nearer than Southern France. The fossil seeds correspond closely with the living *Hypecoum pendulum* of Southern France, and either belong to that species or to a closely allied extinct form. The seeds of all the species of *Hypecoum* are covered by a curious close mosaic of cubic crystals, apparently calcium oxalate, which fill square pits in the surface of the testa, Traces of these pits are still found on some of the fossil seeds.

At the same meeting Mr. G. C. Druce read a paper "On *Poa laxa* and *Poa stricta* of our British Floras." For some years past, doubts have been expressed by critical botanists as to the correct naming of these two plants, and to clear up these doubts the author has examined the material in various herbaria—of the late Professor C. C. Babington, the British collection at the British Museum, the specimens gathered by George Don on Loch-na-gar, the Boswell-Syme set, and Smith's collection in the Society's possession. His conclusions are that the plants have been misunderstood and variously named.

A paper on "The Botany of the Ceylon Patanas, Part II.," by Messrs. J. Parkin and H. H. W. Pearson, was read at the same meeting. In a former paper on the same subject (Journ. Linn. Soc., Bot. xxxiv. 300–365) the main features of these grassy uplands, locally known as "patanas," were given, the probable causes which have led to their development discussed, and the general biological characters of their flora described. An account of the anatomical examination of the plants collected was now given.

The leaves of eighty plants, representing about two-fifths of the Dicotyledons of the patanas, have been submitted to a close microscopical investigation, exact measurements made of several parts of their anatomy, and these, together with other details, arranged in the form of a table. Such data are compared for the plants as a whole, and afterwards for the "wet" and "dry" patana-plants separately. The difference between the two sets of leaves as regards xerophytic characters and those serving as protections against excessive illumination, is very slight—a result hardly to be anticipated considering that the conditions of soil and rainfall vary greatly for the two kinds of patana. The anatomy of erect and semi-erect leaves was investigated to see how far the structure corresponds with the habit. Special points bearing on xerophytism in the leaf-anatomy of some of the plants were described, and a few other matters of anatomical and physiological interest were brought to notice.

At the meeting of the Society on April 2nd, a paper by Mrs. Gépp was read, on the Marine Algæ collected at the Maldive and Laccadive Islands by Mr. J. Stanley Gardiner. The author stated that there appears to be no record of the marine algæ of these islands. The list now presented includes one new species, *Liebmannia Laccadivarum*, but the bulk of the remainder are already known from the Indian Ocean; one plant, *Ectocarpus spongiosus* Dickie, is interesting, as permitting a hitherto doubtful species to be cleared up; and the material of another, *Ralfsia ceylanica* Harv. MS., allows of a diagnosis being drawn up of an alga hitherto undescribed, and known only in herbaria. The entire number enumerated amounts to twenty-five.

At the same meeting Dr. D. T. Gwynne-Vaughan gave a lantern demonstration of his paper on the Comparative Anatomy of the *Cyatheaceæ* and other Ferns. He stated that the vascular system at the very base of the stem of a young plant of *Alsophila excelsa* is found to be protostelic, and as it advances towards the more complicated structure of the mature stem, it passes through transitional stages which in certain other ferns are retained as the permanent structure of the full-grown plant. The first departure in the young plant from the protostelic type of structure is due to the appearance of a core of phloem within the substance of the xylem of the protostele. This gives rise to a type of structure which may be found in the mature stem of *Davallia repens*. Then, in the young plant, the endodermis and ground-tissue lying on the adaxial side of the departing leaf-traces is prolonged downwards into the internal core of phloem. These decurrent strands of ground-tissue at first end blindly in the core before reaching the node below, giving rise to a type of stele which is also to be found in the mature stem of *D. pinnata*. When the decurrent ground-tissue becomes continuous from one node of the young plant to the other, a solenostelic structure is reached, similar to that found in the mature stems of a large number of ferns. It is suggested that this series illustrates the manner in which the transition from pro-

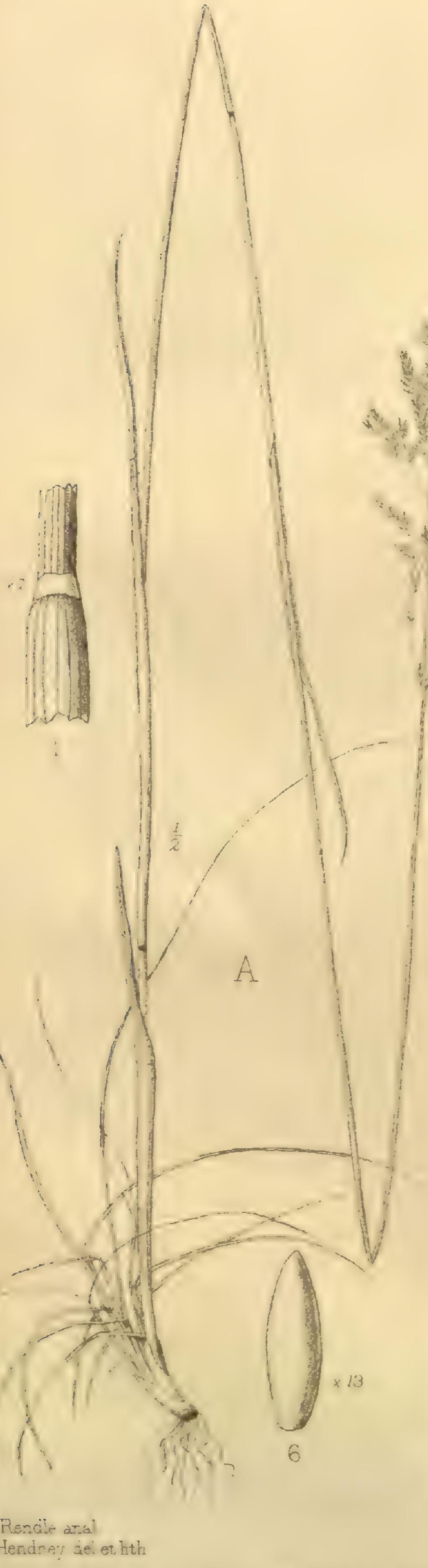
tostely to dictyostely took place in the *Cyatheaceæ* and *Polypodiaceæ*. That is to say, the ancestral protostele of these two orders never contained a definite pith, and its conversion into a solenostele began by the replacement of some of its xylem elements by phloem, later on by endodermis and ground-tissue. This suggestion is not in any way affected by the question as to the cortical or stelar nature of the internal ground-tissue. The xylem in the steles of fern-stems seems to be differentiated in two ways. Either the protoxylem elements are more or less evenly distributed all round the periphery of the xylem mass, or else they are localized in definite endarch or mesarch strands. In the latter case the protoxylem strands of the stem are always related directly or indirectly with those in the leaf-trace. In the more primitive Pteridophyta in which the influence of the leaf-trace upon the stem-stele is practically negligible, the protoxylem is nearly always exarch, and it would seem that endarchy originated in the leaf-trace, and that, in in general, it appeared in the stem only when the influence of the leaf-trace had begun to dominate the structure of the latter.

In the *Transactions of the British Mycological Society* for 1902, Dr. M. C. Cooke, Miss A. Lorrain Smith, and Mr. Carleton Rea supply lists of fungi that have been added to the Flora of our country during the past year. The various field-workers have been successful in adding many new species to science, and also in finding forms already recorded on the Continent. Fungi have an unusually wide distribution, probably owing to the lightness of the spores, and the British Isles, as a field of discovery, are not yet exhausted. Mr. R. H. Biffen contributes an interesting account of the mould *Acrospeira mirabilis*, the entire life-history of which he has been able to trace. Dr. C. B. Plowright gives a list of British *Pucciniæ* or *Umbelliferæ* according to Lindroth's recent classification, and short papers are published by several fungologists on different branches of the subject. The whole number is full of interest and is practically indispensable to whoever wishes to keep abreast of such a growing science as mycology.

Mr. William Robinson's new serial *Flora and Sylva* is handsome, but not cheap. The first number contains forty-six well-printed quarto pages and two excellent coloured plates, with other illustrations in the text; but *The Burlington Magazine* has lately shown us that much more than this can be given for half-a-crown (net).

The recently issued part of the *Flora of Tropical Africa* contains the completion of the *Asclepiadeæ* by Mr. N. E. Brown; the *Loganiaceæ* by Mr. J. G. Baker; and the *Gentianeæ* by Messrs. Baker and Brown.

The publication is announced of the *Alga-Flora of Yorkshire*, "a complete account of the known Freshwater Algæ of the County, with many notes on their affinities and distribution," by Messrs. W. and G. S. West.



A. E. Rendle ad nat
S. C. Hendrey del. et lith

West, Newman imp

A. Poa stricta. *D. Don.*

B. P. leptostachya *D. Don.*

POA STRICTA D. DON AND *P. LEPTOSTACHYA* D. DON.

By A. B. Rendle, M.A., D.Sc.

(Plate 452.)

In an article entitled 'Descriptions of several New or Rare Scottish Plants' in the *Memoirs of the Wernerian Natural History Society*, vol. iii. (1821), David Don described two new species of *Poa*—*P. stricta* (p. 298) and *P. leptostachya* (p. 299). The grasses were collected by his father George Don, and the descriptions "drawn up from the original native specimens preserved in my father's herbarium." As these species are not mentioned in our British "Floras," and are marked with a "quid?" in the *Index Kewensis*, the following account, with accompanying plate, prepared from George Don's original specimens, which are named in David Don's hand, may be useful to those interested in British grasses. The specimens will be found in the British Herbarium at the Natural History Museum; they were purchased, with other specimens collected by George Don and contained in David Don's herbarium, at the Linnean Society's sale in 1863.

Poa stricta D. Don in Mem. Wern. Soc. iii. 298 (1821). The following is a transcription of Don's account:—

"Panicula ramosa, spiculis 3-floris ovatis; glumis lanceolatis trinervibus subæqualibus mucronatis carinatis, paleis quinquenerviis apice truncatis flosculis basi villosis.

"*Culmus* erectus bipidalis [*sic*] gracilis teres glaber articulatus; folia radicalia anguste-liniaria [*sic*] glaberrima pallide viridia striata margine inermia, caulina brevia pungentia longe vaginantia, vaginis lævibus striato sulcatis; ligula brevissima apice obscindenti lacerato-ciliata; panicula compacta ramosa fusco-rubra ramulis pedicellisque spinuloso asperis, spiculi 3-flori conferti ovati, glumæ subæquales lanceolatæ trinerves mucronatæ carinatæ (carina aspera) margine ciliatæ, paleæ 5-nerviæ apice truncatæ margine scariosæ; flosculi basi villis longis retrofractis tecti. Affinis Poæ pratensi, attamen posterior videtur distincta, spiculos 4-flores, glumas ovato-lanceolatas, 5-nervias, paleas acutiusculas nec truncatas, folia latiora, spiculos majores habere.

"This species was discovered many years ago in pastures in Angusshire by the late Mr. G. Don of Forfar."

I have added the following notes from examination of Don's type plant:—

Cauline leaves three, the sheaths much exceeding the blades; uppermost blade shortest, $1\frac{1}{3}$ inch long, and $\frac{1}{2}$ line in half-width in its natural plicate condition; ligule $\frac{1}{2}$ line long, sheath $5\frac{1}{2}$ in. long. Uppermost node just below the middle of the stem. Leaves on barren shoots, slender and stiffish, with long convolute blades, the longest 7 in. long, $\frac{1}{4}$ line thick. Panicle $3\frac{2}{3}$ in. long, 1 in. or less in width, with three branches at each node; at the lower nodes apparently five branches from the production of a shorter secondary branch right at the base of the two lateral branches; median

branch at lowest node nearly two inches long, the lateral 1¼ and 1 in. respectively. Branches bare for less than half their length, branched above; secondary branches numerous, ascending, closely spiculiferous nearly or quite to the base with four or, in the case of the upper, fewer spikelets. Spikelets subsessile or shortly pedicelled, sometimes 2-flowered, with an aborted upper floret; 1⅗ line long. Outermost barren glume one-nerved, 1⅛ line long; the second 3-nerved, 1¼ lines. Lowest fertile glume 1½ line long, including the short (1/10 line) fertile pedicel, which bears a dense tuft of long tangled wool; the upper ⅙, thin and transparent, below which is a purple band; dorsal vein hairy for nearly two-thirds its length from the base, marginal vein hairy for about half its length. Pale 1 line long. Anther ¾ line long. Grain ¾ line long.

I do not think that the slight differences cited by Don are sufficient to remove this grass from *Poa pratensis*. On one point Don is in error, namely, when he refers to the barren glumes of *P. pratensis* as 5-nerved. The upper is 3-nerved and the lower 1-nerved, or incompletely 3-nerved, and Don's plant agrees with typical *P. pratensis* in this character. The plant is a form of *P. pratensis* with rather small few-flowered spikelets and very narrow basal leaves, and may be placed in *Poa pratensis* var. *angustifolia*, which is *Poa angustifolia* L. Sp. Pl. 67. Babington (Man. Brit. Bot. ed. 8, 435) cites this variety as of Parnell, but I find no reference to it in any work by Parnell. Smith, Fl. Brit. i. 105 (1800), makes *P. angustifolia* L. a variety of *P. pratensis*, citing it under the latter as var. β, but giving no varietal name. The varietal name apparently dates from Gaudin in 1811 (Agrost. Helvet. i. 214).

Poa leptostachya D. Don, *l. c.* 299. The following is Don's account:—

"Panicula contracta subracemosa; pedicellis brevissimis glaberrimis, flosculis 2-floris, glumis lanceolatis mucronatis æqualibus trinervibus, apice incurviis, paleis lanceolatis apice acutiusculis.

"Radix fibrosa perennis cæspitosa; culmi decumbentes geniculati teretes lævissimi; folia brevia liniaria [*sic*], plana nervosa læte-viridia glaberrima margine inermia basi vaginantia, vaginis foliis longioribus glabris striatis; panicula contracta subracemosa depauperata, ramis brevibus, pedicellis brevissimis glaberrimis; spiculæ 2-floræ, glumæ lanceolatæ mucronatæ æquales trinerves (nervis nigrescentibus conspicuis) apice incurvæ dorso carinatæ carina sub microscopum spinuloso aspera, paleæ lanceolatæ apice acutiusculæ, flosculis nudis.

"This *Poa* is totally distinct from any British species, and there is none with which it has a near affinity. Found on the banks of the Tay, to the west of Dundee, by the late Mr. G. Don, of Forfar, who cultivated it many years under the name of *P. depauperata*—a name which I should have wished to retain; but as it is already applied to a very distinct species found by Humboldt and Bonpland in Equinoctial America, and described under that name in their *Nova Genera et Species Plantarum*, I have been obliged unwillingly to alter it."

George Don's label with the specimen bears the name *Poa depauperata*.

I have added the following notes:—

About a foot high. Stem flattened; stem-leaves four; uppermost node bare, just above the middle of the stem; uppermost blade shortest, a little over an inch long, sheath 1½ in.; second blade 2 in. long, ⅘ line broad, sheath 1⅔ in.; ligule 1 line. Panicle 1½ in. long, branches two at each node, with a short secondary branch springing from the base of one, except at the upper nodes, where the branches are much reduced; branches ½ in. long or less, bare for one-third to one-fourth their length from the base, shortly branched above and bearing six or fewer spikelets. The spikelets have a pinched appearance, and the upper part of the inflorescence is more or less blasted as a whole. Spikelets 1¾–1⅚ lines in length, subsessile, sometimes 3- or 4-flowered. Barren glumes 3-nerved, or the lateral nerves wanting in the lower glume; the lower 1⅐ line long, the upper slightly longer (1¼ line); the lowest fertile glume as long as the upper barren glume. Fertile glumes 5-nerved; the dorsal vein hairy for about one-third (sometimes nearly half) its length from the base, the marginal vein very sparsely hairy in the lower fourth of its length; the median lateral vein is inconspicuous; the upper sixth colourless and thin, tinged with purple below. Pale 1 line long or less, often withered; anthers three, linear, ½ line or less. In the flowers which I opened I found no stigmas on the ovary, which seems more or less aborted. The short pedicel below the fertile glumes is shortly hairy but bears no wool; the rachis is glabrous.

David Don refers to the cultivation of the plant by his father for many years, but does not say whether it ever produced seeds. It is evidently a depauperate form of something; most probably of *P. compressa* L., which it resembles in the geniculate compressed stem, the faint intermediate veins of the fertile glumes, and the absence of conspicuous webbing in the spikelets. The ligule is rather less truncate than usual in *P. compressa*.

Description of Plate 452.

A. *Poa stricta* D. Don (half nat. size). 1. Portion of leaf showing ligule, × 2. 2. A two-flowered spikelet, × 10. 3. Lower fertile glume, × 10. 4. Pale from same flower, × 10. 5. Anther, × 10. 6. Fruit, × 13.

B. *Poa leptostachya* D. Don (half nat. size). 1. Portion of leaf showing ligule, × 2. 2. A two-flowered spikelet, × 10. 3. The same after removal of the barren glumes, × 10. 4. Lodicule, × 10. 5. Anther, × 10. 6. Ovary, × 10.

THE SPHAGNA OF UPPER TEESDALE.

By E. C. Horrell, F.L.S.

In August 1901, Mr. D. A. Jones, F.L.S. of Harlech and I visited Upper Teesdale for the purpose of studying the bog-mosses of the district. The flowering plants and mosses of Teesdale have been studied by many competent botanists in the past, but the bog-mosses have never received the attention that my superficial observations made during a brief visit two years previously had shown they deserved. Our studies have done something to fill this lacuna. Mr. Jones and I stayed nearly the whole month at Widdy Bank Farm, most conveniently situated for studying the flora of the elevated moorlands, and owing to the great kindness of Mr. Gibson and his daughters were able to press and dry the very large number of soaking *Sphagnum* specimens we collected. On the whole nearly 8000 specimens were gathered from nearly 1000 separate tufts.

The localities visited and collected in were all within three miles of Widdy Bank Farm and it would perhaps be difficult to find in any district in Great Britain, within a radius of three miles, a larger number of *Sphagnum* forms. The localities collected in were as follows:—

(1). A small patch of boggy ground just at the upper limit of the wood which lines the Tees at the High Force Waterfall (v.-c. 66). Here the bog-mosses were growing amongst tall grasses and shrubs, and were thus considerably shaded. *S. Girgensohnii* vars. *commune* and *hydrophilum* were the most uncommon forms found here.

(2). A piece of boggy ground where peat was being cut, just opposite Forest Post Office (v.-c. 66). Here *S. fimbriatum* was growing freely, but was not again seen in the district except as var. *compactum* by the side of Maize Beck.

(3). The elevated moorland along the Langdon Beck, terminating with the ridge separating Teesdale from Weardale (v.-c. 66). *S. recurvum* and *S. parvifolium* were both exceedingly common near the stream and in some deep pools near the head of the stream the former was found in an exceptionally fine and robust submerged form. *S. medium* was common under the heather on the moorland slopes.

(4). Widdy Bank Fell (v.-c. 66). On this large mountain, as will be seen from the list following, almost all the forms met with in the district occur; and many of them, notably the forms of *S. Russowii*, *S. medium*, and *S. imbricatum*, in great abundance and luxuriance. The more shady portions of the fell were the most productive, and notably the sides of the small streams and the deep boggy land near the Tees just above the Chauldron Snout. In the big bog to the left of the path from Chauldron Snout to Widdy Bank Farm great mounds of *S. imbricatum* and *S. fuscum* occur. A gamekeeper told us that he remembered one of these mounds—a very large one formed of *S. imbricatum* only—for twenty or more years.

(5). Meldon Fell (v.-c. 69). Only the low-lying boggy ground near the Tees was collected in, and here *S. medium* was particularly fine and fruited freely. *S. imbricatum* was also common.

(6). The Westmoreland side of Maize Beck (v.-c. 69), and (7) the Yorkshire side of Maize Beck (v.-c. 65). Here the most marked bog-mosses were compact forms of *S. fimbriatum* (f. *compacta*), of *S. Girgensohnii* (var. *xerophilum*), and of *S. teres*. All these very closely resembled each other, and were scarcely distinguishable in the field.

(8). Cronkley Pastures (v.-c. 65). Under this name I have included all the low-lying flat lands on the Yorkshire side of the Tees from the Langdon Beck to the Maize Beck. Many finely developed forms grow here, especially in the shade of the heather or of the huge boulders which have fallen from Cronkley Scar. In this latter situation some of the finest specimens collected were growing in wonderful luxuriance.

(9). Cronkley Fell (v.-c. 65). The high moorland at the top of Cronkley Scar, and from there to the White Force. This ground bears a considerable resemblance to the opposite moorland on the top of Widdy Bank Fell.

(10). Slopes of Mickle Fell (v.-c. 65). These slopes, reaching from the summit of Mickle Fell, the highest point in Yorkshire, to the edge of the cliffs overlooking the Tees, were only moderately productive of bog-mosses, but were not sufficiently explored by us. The ground is much cut up by "brocks," deep channels cut in the peaty soil by temporary watercourses; and these "brocks" were found to be almost devoid of any *Sphagnum* vegetation.

It will be seen that collections were made in three vice-counties, *viz.* Durham (66), N. W. York (65), and Westmoreland (69). The most striking characteristics of the *Sphagnum* flora of the district were (1) the wonderful abundance of forms belonging to the *acutifolium* group; (2) the abundance of most varied forms of *S. medium*; (3) the comparative scarcity of the species of the *subsecundum* and *cuspidatum* groups.

In the *acutifolium* group all the eleven European species (excepting *S. tenerum*) were found, and generally in extraordinary abundance. The scarcity of *subsecundum* forms may be due to the few permanently dripping rocks, and that of *cuspidatum* forms to the few permanent pools in the district.

We cannot pretend to have completely exhausted the *Sphagnum* flora of even the limited portion of Upper Teesdale explored by us, and doubtless numerous other forms will eventually be discovered there: perhaps the finest form discovered by us, *S. Girgensohnii* var. *spectabile*, was only met with on the morning we were leaving; and *S. fimbriatum*, which I had gathered in two different spots on Widdy Bank Fell on my previous visit, was not again met with, although it was constantly looked for.

The following list contains twenty-eight species and eighty-one varieties:—

Sphagnum fimbriatum Wils. Comparatively rare in the district, being more frequently found in lowland districts. Widdy (*E. C. H.*,

Aug. 1899; not rediscovered here in 1901); bog opposite Forest Post Office, fruiting freely.

Var. *compactum* Warnst. By side of Maize Beck, Westmoreland. Scarcely distinguishable in the field from forms of *S. Girgensohnii* and *S. teres*.

S. Girgensohnii Russ. Fairly common and varying considerably; some forms very tall and robust, others compact and slender. Not seen fruiting.

Var. *commune* Russ. Bog above High Force; Widdy; Cronkley Pastures; Cronkley Fell; Mickle Fell.

Var. *coryphæum* Russ. Cronkley Pastures.

Var. *cristatum* Russ. Widdy; Meldon; Cronkley Pastures.

Var. *hydrophilum* Russ. Bog above High Force; Widdy; Cronkley Pastures; Cronkley Fell; Mickle.

Var. *spectabile* Russ. in Arch. Naturk. Liv. Est. & Kurlands. Ser. ii. Bd. x. Lief. 4, 502. Stem-leaves large to very large, lingulate, strongly truncate and fimbriate; capitulum generally very conspicuous, with long recurved branches. Generally light green to light greenish-yellow, also dark green. Generally large stately forms. Cronkley Pastures. An exceedingly handsome form.

Var. *stachyodes* Russ. Widdy; Cronkley Pastures.

Var. *xerophilum* Russ. Widdy; side of Maize Beck, Yorkshire; Cronkley Fell; Mickle Fell.

S. Russowii Warnst. Common, generally forming very deep loose tufts. One of the handsomest bog-mosses. Not seen in fruit.

Var. *flavescens* Russ. Widdy; Cronkley Fell; Mickle Fell.

Var. *pœcilum* Russ. Very common, especially under heather on Widdy; Cronkley Fell.

Var. *rhodochroum* Russ. Very common and fine. Widdy; near White Force (*W. Ingham*, Aug. 20, 1897); Cronkley Pastures; Cronkley Fell; Mickle.

Var. *virescens* Russ. Very common. Bog opposite Forest Post Office; Langdon; Widdy; Cronkley Pastures; Cronkley Fell; Mickle.

S. Warnstorfii Russ. Rare. Not in fruit.

Var. *purpurascens* Russ. Widdy; Meldon.

Var. *versicolor* Russ. Widdy; Cronkley Fell.

Var. *viride* Russ. Bog above High Force; Widdy.

S. rubellum Wils. Exceedingly common; varying much in colour; sometimes forming high tussocks like those of *S. fuscum* and *S. imbricatum*. No fruit seen.

Var. *flavum* C. Jens. Not common. Widdy; Meldon.

Var. *pallescens* Warnst. Langdon; Widdy; Meldon; Cronkley Fell; Mickle.

Var. *purpurascens* Warnst. Abundant. Langdon; Widdy; Meldon; Cronkley Fell; Mickle.

Var. *rubrum* Grav. Very common. Langdon; Widdy; Cronkley Pastures; Cronkley Fell (*W. Ingham*, June, 1897); Mickle.

Var. *versicolor* Russ. Very common. Langdon; Widdy; Cronkley Fell (*W. Ingham*, June, 1897); Mickle.

Var. *viride* Warnst. Langdon; Widdy; Cronkley Pastures; Cronkley Fell.

S. FUSCUM Klinggr. Common, and fruiting freely in several places. Generally forming large, deep, very compact hummocks. Only found in the more elevated parts of the district.

Var. *fuscescens* Warnst. Widdy; Meldon; Cronkley Fell.

Var. *pallescens* Russ. Widdy.

S. ACUTIFOLIUM R. & W. Very common. Rarely in fruit.

Var. *chlorinum* Warnst. Widdy.

Var. *flavescens* Warnst. Mickle.

Var. *flavo-rubellum* Warnst. Langdon; Widdy; Meldon; Cronkley Pastures; Cronkley Fell.

Var. *fusco-virescens* Warnst. Widdy.

Var. *griseum* Warnst. Widdy.

Var. *obscurum* Warnst. Widdy; Cronkley Pastures.

Var. *pallescens* Warnst. Widdy; Cronkley Fell.

Var. *purpurascens* Warnst. Very common. Widdy; Meldon; Cronkley Pastures; Cronkley Fell; Mickle.

Var. *roseum* Warnst. Widdy.

Var. *rubrum* Warnst. Widdy.

Var. *versicolor* Warnst. Very common. Widdy; Maize Beck, Yorkshire; Cronkley Pastures; Cronkley Fell; Mickle.

Var. *viride* Warnst. Langdon; Widdy; Cronkley Fell; Mickle.

S. QUINQUEFARIUM Warnst. Common, generally forming deep loose masses under heather and boulders.

Var. *fusco-flavum* Warnst. Widdy; White Force (*W. Ingham*, June, 1897).

Var. *pallescens* Warnst. Widdy; Cronkley Pastures; Cronkley Fell; Mickle.

Var. *roseum* Warnst. Widdy; Meldon; Cronkley Pastures.

Var. *virescens* Warnst. Widdy; Cronkley Pastures; Cronkley Fell; Mickle.

S. SUBNITENS R. & W. Abundant everywhere. Generally fruiting freely.

Var. *flavescens* Warnst. Widdy; Cronkley Pastures; Cronkley Fell.

Var. *flavo-rubellum* Warnst. Very common. Bog opposite Forest Post Office; Langdon; Widdy; Meldon; side of Maize Beck, Yorkshire; Cronkley Pastures.

Var. *griseum* Warnst. Meldon.

Var. *obscurum* Warnst. Top of Langdon Beck (*W. Ingham*, July, 1896); Widdy; Meldon; Cronkley Pastures; Cronkley Fell.

Var. *pallescens* Warnst. Widdy; Cronkley Pastures; Cronkley Fell; Mickle.

Var. *purpurascens* Schlieph. Widdy; Meldon; Cronkley Pastures; Cronkley Fell.

Var. *versicolor* Warnst. Very common. Langdon; Widdy; Meldon; Cronkley Pastures; Cronkley Fell; Mickle.

Var. *violascens* Warnst. Widdy; Cronkley Fell.

Var. *virescens* Warnst. Bog above High Force; Widdy; Cronkley Pastures; Cronkley Fell; Mickle.

S. MOLLE Sulliv. Rare, but fruiting freely. Widdy.

S. SQUARROSUM Pers. Rare, but fruiting freely.

Var. *spectabile* Russ. Cronkley Pastures; Mickle.

Var. *subsquarrosum* Russ. Near Maize Beck, Westmoreland; Mickle.

S. TERES Angstr. Common, but always barren.

Var. *imbricatum* Warnst. Langdon; Widdy; side of Maize Beck, Yorkshire and Westmoreland; Cronkley Pastures; Cronkley Fell; Mickle.

Var. *squarrosulum* Warnst. Langdon; Widdy.

Var. *subsquarrosum* Warnst. Bog above High Force; Widdy; side of Maize Beck, Yorkshire; Cronkley Pastures; Mickle.

S. CUSPIDATUM R. & W. Very common; generally barren.

Var. *falcatum* Russ. Widdy; Cronkley Fell; Mickle.

Var. *plumosum* N. & H. Widdy.

Var. *submersum* Schimp. By far the commonest variety. Langdon; Widdy; Meldon; Mickle.

S. PULCHRUM Warnst. Rare. Meldon.

S. RECURVUM R. & W. Exceedingly common, but always barren.

Var. *amblyphyllum* Warnst. Langdon; Widdy.

Var. *mucronatum* Warnst. By far the commonest variety. Bog above High Force; Langdon; Widdy; Meldon; Cronkley Pastures; Cronkley Fell; Mickle.

S. PARVIFOLIUM Warnst. Common, but barren. Langdon; Widdy; Cronkley Pastures; Mickle.

S. MOLLUSCUM Bruch. Common. Fruiting fairly freely. Widdy; Meldon.

f. *compacta* Warnst. Widdy (*W. Ingham*, July, 1898).

f. *longifolia* Lindb. Widdy.

S. COMPACTUM DC. Fairly common. Fruit rare.

Var. *imbricatum* Warnst. Widdy; Cronkley Fell.

Var. *subsquarrosum* Warnst. Widdy.

S. INUNDATUM Warnst. Rare. Widdy; Cronkley Fell.

S. GRAVETII Warnst. Rare. Widdy.

S. RUFESCENS Warnst. Common. Widdy; Meldon; side of Maize Beck, Yorkshire; Cronkley Fell; Mickle.

S. IMBRICATUM Russ. Common; almost always in large deep hummocks.

Var. *cristatum* Warnst. Widdy; Meldon; Mickle.

Var. *sublæve* Warnst. Widdy.

S. TURFACEUM Warnst. Rare. Mickle.

S. CYMBIFOLIUM Warnst. Very common. Fruit rare.

Var. *carneum* Warnst. Cronkley Pastures.

Var. *flavo-glaucescens* Russ. Cronkley Fell.

Var. *fuscescens* Warnst. Cronkley Pastures.

Var. *fusco-flavescens* Russ. Widdy; Cronkley Pastures.

Var. *fusco-glaucescens* Warnst. Cronkley Pastures.
Var. *glaucescens* Warnst. Bog above High Force; Widdy; Meldon; Cronkley Fell.
Var. *glauco-pallens* Warnst. Cronkley Fell.
Var. *pallescens* Warnst. Widdy; Cronkley Pastures; Mickle.

S. PAPILLOSUM Lindb. Very common, and fruiting freely.
Var. *normale* Warnst. Bog opposite Forest Post Office; Widdy; Meldon; side of Maize Beck, Yorkshire and Westmoreland; Cronkley Pastures; Cronkley Fell; Mickle.
Var. *sublæve* Limpr. Widdy; Mickle.

S. MEDIUM Limpr. Abundant. Fruit not common.
Var. *fuscescens* Warnst. Mickle.
Var. *glaucescens* Russ. Widdy; Mickle.
Var. *glauco-purpurascens* Russ. Meldon.
Var. *obscurum* Warnst. Langdon.
Var. *purpurascens* Warnst. Common. Widdy; Meldon; side of Maize Beck, Westmoreland; Mickle.
Var. *roseo-pallescens* Warnst. Widdy; Meldon; Mickle.
Var. *roseum* Warnst. Very common. Langdon; Widdy; Meldon; Cronkley Fell; Mickle Fell.
Var. *versicolor* Warnst. Widdy; Meldon; Cronkley Fell; Mickle.

THE INDIGOFERAS OF TROPICAL AFRICA.

By Edmund G. Baker, F.L.S.

It is a matter of some difficulty to decide which of the several genera closely allied to *Indigofera* should be subordinated to that genus, and which should be retained as distinct.

Acanthonotus Benth. Fl. Nigrit. p. 293, differs from the true Indigoferas considerably in the character of the legume, which is falcate, subtriquetrous, and 1-seeded. I have retained it as a well-marked section containing two species, *I. echinata* Willd. and *I. drepanocarpa* Taubert.

Amecarpus Benth. in Lindley, Veg. Kingdom, p. 554 (1847), founded on *Indigofera senegalensis*, I have also, following many authors, retained as a section, noticeable on account of the compressed pod.

Indigastrum Jaubert & Spach, Pl. Or. t. 492, has a rostrate acuminate keel, which is ecalcarate, but with no marked difference in the pod from the true Indigoferas.

Rhynchotropis Harms in Engler, Bot. Jahrb. xxx. p. 86 (1901) includes two species:—*R. Poggei* Harms (*Indigofera Poggei* Taubert), and *R. Dekindtii* Harms. Dr. Harms states that it differs from *Indigofera* by the rostrate keel, and by the singular broadened style. The rostrate keel occurs also in the genus Indigastrum of Jaubert & Spach, which has generally been reduced by authors to *Indigofera*; but I retain *Rhynchotropis* as distinct, more particularly on account of the peculiar anthers, which are barbulate above and below.

Sphæridiophorum Desvaux, Journ. Bot. iii. (1813), p. 125, t. 6, founded on *I. linifolia* Retz, differs from the true Indigoferas in the ovoid globose legume. I have retained it as a section, but the exact limits are somewhat difficult to define. In *I. linifolia* the pods are globose and 1-seeded, but in certain species 1-seeded and also 2-seeded pods occur in the same plant. In *I. demissa* Taubert, for instance, the legume is either suborbicular and monospermous or ovate-oblong and dispermous.

I have ventured to propose two new groups in the *Euindigoferæ* —the first (for those plants in which simple leaves are found associated with compound leaves, as, for instance, in *I. Schweinfurthii* Taubert, *I. trimorphophylla* Taubert, *I. Dupuisii* Micheli, &c.), I have named Heterophyllæ; the other (for *I. strobilifera* Hochst. and its allies, *I. lupulina* Baker and *I. lanuginosa* Taubert, in which the flowers are concealed by broad imbricating bracts), I have named Opertifloreæ. My father associated *I. strobilifera* Hochst. with *I. capitata* Kotschy in the *Capitatæ*, but the structure of the heads of *I. capitata* is different. Dr. Taubert places *I. strobilifera* Hochst. in the group Trichopoda, but the typical species of this group, *I. trichopoda*, is very different.

§ **Acanthonotus** Benth. Fl. Nigrit. p. 293 (1849) (genus). — Pod short, falcate, subtriquetrous, the dorsal suture dilated and more or less prickly or rough, 1-seeded.

* Raceme generally 6–10-flowered. Pod on the back ± echinate.

1. I. echinata Willd. Sp. Pl. iii. 1222 (1800); Baker in Flora Trop. Afr. ii. p. 69 (1871).

Acanthonotus echinatus Benth. *l. c.*

Hab. Upper Guinea. Senegambia, *Heudelot*! Niger, *Vogel*! *Barter*! East Tropical Africa. Zanzibar, *Hildebrandt*, no. 930, ex Vatke. Quilemane, Nyambo, *L. Scott*!

** Raceme generally 15–20-flowered. Pod on the back rough, hardly echinate.

2. I. drepanocarpa Taubert in Engl. Pl. Ost. Africa, Theil c. p. 209 (1895).

Hab. East Tropical Africa. Unjamwesi, *Boehm*. Bukoba! Utundua, and S.W. Victoria Nyanza. Muansa and Ussukuma, *Stuhlmann*. Chusezi, *Dr. A. Bagshawe*.

§§ **Sphæridiophora** Desv. Journ. Bot. iii. (1813), p. 125, t. 6 (genus). —Pod small, globose or ovoid, or shortly oblong, 1-seeded, rarely occasionally 2-seeded.

* Leaves simple, linear, clothed with silvery pubescence.

3. I. linifolia Retz, Obs. iv. p. 29 (1786): vi. p. 33, t. 2 (1791); Baker, *l. c.* p. 70 (1871); Schweinf. in Bull. Herb. Boiss. App. ii. p. 236 (1896); Chiov. in Ann. Ist. Roma, viii. fasc. i. p. 90 (1903).

Sphæridiophorum linifolium Desv. *l. c.*

S. abyssinicum Jaub. et Spach, Illust. t. 494 (1853–57).

Hab. Nile Land. Abyssinia! Nubia. Eritrea.

** Leaves compound.

+ Flowers in more or less densely congested heads or racemes.

4. I. TERMINALIS Baker in Fl. Trop. Afr. ii. 70 (1871).

Hab. UPPER GUINEA. Senegambia, *Heudelot*, no. 365!

5. I. lotononoides, sp. nov. Frutex. Caulis lignosus cortice nigrescente. Ramuli virgati elongati teretes cortice pallide brunneo. Folia modice petiolata plerumque trifoliolata. Foliola oblonga vel obovato-oblonga molliter pubescentia. Flores axillares glomerulati pedicellis gracilibus albo-pilosis. Calyx pilosus, calycis tubus brevis lobi anguste lanceolati quam tubus multoties longiores. Carina inæquilateraliter oblonga apice albo-pilosa et obtusa. Antheræ apiculatæ. Ovarium subglobosum. Legumen subglobosum monospermum lateraliter subcompressum apice mucronatum calycis lobis subæquilongum breviter albo-pilosum.

Hab. NILE LAND. Dar Fertit, *Schweinfurth*, ser. ii. no. 63!

Branchlets in the specimens before me, 30–35 cm. long. Leaves generally trifoliolate, occasionally simple, petiole ± 5 mm., lamina under 1 cm. long, ± 5 mm. broad. Calyx ± 3·5 mm. long, tube very short, covered with white hairs. Carina 3·5 mm. long. Legume 3·0–3·5 mm. long.

6. I. CONGESTA Welw. ex Baker, *l. c.* p. 70; Hiern, Welwitsch Cat. i. p. 206 (1896).

Hab. UPPER GUINEA. Congo, *C. Smith*! Sierra Leone, Wallia, *Scott Elliot*, no. 4252! 4308! Niger Exped. *Barter*! LOWER GUINEA. Angola, Pungo Andongo, *Welwitsch*, no. 2041! EAST TROPICAL AFRICA. Usambara, *Holst*, no. 3188! Msilala, *J. Hannington*!

7. I. MACROCALYX Guill. & Perr. Fl. Seneg. p. 175, t. 46 (1833); Baker, *l. c.* p. 71.

Hab. UPPER GUINEA. Senegal, *Perrotet*, no. 193! Congo, *C. Smith*! Sierra Leone, *Afzelius*! Wallia, *Scott Elliot*, no. 4270!

++ Racemes not so dense, fewer flowered.

⊙ Silvery incanous.

8. I. KARONGENSIS Baker in Kew Bull. 1897, p. 255.

Hab. BRITISH CENTRAL AFRICA. Between Kondowe and Karonga, *Whyte*!

⊙⊙ Slightly silvery incanous.

9. I. MICROCALYX Baker, *l. c.* p. 256.

Hab. BRITISH CENTRAL AFRICA. North Nyassaland, Zomba, *Whyte*! Unangu to Lake Shire, *A. W. P. Johnston*, no. 75.

+++ Peduncles generally 3–5-flowered.

⊙ Peduncles filiform, 2–3 cm. long.

10. I. SCARCIESII Scott Elliot in Journ. Linn. Soc. xxx. p. 76 (1894).

Hab. UPPER GUINEA. Near Buyabuya, Scarcies River, *Scott Elliot*, no. 4765! Pod oblong, 1-seeded.

⊙⊙ Peduncles shorter, not as long as the leaves.

11. I. DEMISSA Taubert in Engl. Pl. Ost. Africa, Theil c. p. 209 (1895).

Hab. EAST TROPICAL AFRICA. Zanzibar, *Stuhlmann*. BRITISH CENTRAL AFRICA. Nyassaland, *Buchanan*, no. 1163! East coast of Lake Nyassa, *A. W. P. Johnston*.

§§§ Euindigofera.—Pods linear, terete or subtetragonous, unarmed, usually 2–∞ -seeded, rarely sometimes 1-seeded.*

Group I. JUNCIFOLIÆ.—Petioles filiform, either leafless or bearing a solitary leaflet.

12. I. PODOPHYLLA Benth. ex Harv. & Sond. Fl. Cap. ii. p. 168 (1861); Ic. Plant. t. 1800.

Hab. EAST TROPICAL AFRICA. Inhambane, *L. Scott*!

Pod 7–11-seeded.

The district of Inhambane is just on the borders of Tropical Africa, and is cut by the Tropic of Capricorn.

Group II. SIMPLICIFOLIÆ.—Leaves simple.

A. Inflorescence copiously panicled.

(*a*) Pod terete, glabrous, 4-seeded.

13. I. PANICULATA Pers. Syn. ii. 325 (1807); Baker, *l. c.* p. 71.

Hab. UPPER GUINEA, *Vahl*.

(*b*) Pod subcompressed, villose, ± 2-seeded.

14. I. PROCERA Schum. Beskr. Guin. Pl. 365 (1828); Baker, *l. c.*; Hiern, *l. c.* p. 207.

Hab. UPPER GUINEA. Senegambia, *Heudelot*! Guinea proper. *Thonning*, *Vogel*, *Barter*! Sierra Leone, *Scott Elliot*. Limba Country, n. 5667! LOWER GUINEA. Angola, Pungo Andongo, *Welwitsch*, no. 2001! Ambaca, *Welwitsch*, no. 2002! Congo Region, Kisantu, *J. Gillet*, no. 403. BRITISH CENTRAL AFRICA. Nyassaland, *Buchanan* (1891), no. 481!

B. Racemes axillary, dense at the apices, or inflorescence sub-paniculate. Legumes 1–2-seeded.

15. I. DEWEVREI M. Micheli in Bull. Soc. Bot. Belg. xxxvii. (1898), 46 (nomen); Illustr. Fl. Congo, t. xxx. (1899); Wildem. & Durand in Bull. Herb. Boiss. p. 12 (1901).

Hab. LOWER GUINEA. Congo, *Dewevre*, no. 197; Hens, no. 275! *C. Smith*! Lualaba, *Deschamps*. Kisantu, *J. Gillet*, nos. 854, 871, 957.

Leaves narrow, lanceolate, shortly petioled. A more northerly form of this species is *I. djurensis* Schweinf. in herb., Kew Bull. 1895, p. 65 (nomen).

Hab. NILE LAND. Bongoland, Gir, *Schweinfurth*, no. 2244! Herb. Mus. Brit.

C. Flowers 1–2-pedicellate in axils of leaves.

16. I. BAINESII Baker in Fl. Trop. Afr. ii. 71 (1871).

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* The plants in which I have noticed 1-seeded pods are *I. bracteolata* DC., *I. amorphoides* Jaub. & Spach, *I. Kirkii* Oliver, *I. djurensis* Schweinf., *I. Dewevrei* Micheli, *I. subulifera* Welw.

Hab. South Central. In the interior near the Tropic of Capricorn, *Baines*! Herb. Kew.

Allied to *I. dealbata* and *I. pungens* from the Cape.

17. I. tetrasperma Thonn. Beskr. Guin. Pl. 365 (1828); Baker, *l. c.* p. 72.

Hab. Upper Guinea. Guinea proper, *Thonning*. Senegambia, *Heudelot*!

Var. hexasperma Vatke in Oesterr. Bot. Zeit. xxviii. p. 203 (1878).

Hab. Zanzibar, *Hildebrandt*, no. 939!

Allied to *I. simplicifolia* Lam.

D. Flowers in dense axillary clusters.

18. I. cordifolia Heyne ex Roth, Nov. Pl. Sp. 357 (1821); Baker, *l. c.*; Schweinfurth in Bull. Herb. Boiss. 1896, App. ii. p. 236; Chiov. *l. c.* p. 88 (1903).

Hab. Nile Land, *Kotschy*, no. 18! Abyssinia, *Schimper*! Col. Eritrea, *Schweinfurth*.

E. Flowers in dense pedunculate heads.

19. I. trachyphylla Benth. in Hook. Icones Plant. t. 1354 (1881).

Hab. British Central Africa. Shire Highlands, *Buchanan*, nos. 45! 65! 412!

20. I. polysphæra Baker in Kew Bull. 1895, p. 65.

Hab. British Central Africa. Lake Tanganyika; Fwambo, *Carson*! Herb. Kew.

Legume 2–3-seeded. Very closely allied to the preceding, which, however, branches copiously near the base, and is more densely covered with ferruginous hirsute pubescence.

F. Flowers in dense racemes.

21. I. fusco-setosa Baker in Kew Bull. 1897, p. 256.

Hab. British Central Africa. Masuku plateau, alt. 6000–7000 ft., and between Kondowe and Karonga, *Whyte*!

Legume 2–3-seeded.

22. **I. Thomsoni**, sp. nov. Fruticulus humilis erectus subsimilis habitu *I. Guthriei* Bolus (in Journ. Bot. 1896, p. 22). Caulis tenuis strigoso-pubescens. Stipulæ lineares quam petiolus fere duplo longiores. Folia simplicia lineari-oblonga ad extremitates attenuata apice mucronata internodiis longiora strigoso-pubescentia tenuiter petiolata. Racemi pauci erecto-patentes juniores densiflori adultiores laxioriflori, quam racemi *I. Guthriei* manifeste floribundiores, foliis 1½–2-plo longiores. Bracteæ setaceæ. Pedicelli calyce breviores. Calycis tubus brevis calycis lobi angusti quam tubus multoties longiores. Vexillum ovatum, alis inæquilateraliter oblanceolatis. Ovarium lineari-teres glabrum pluriovulatum. Legumen maturum haud visum.

Hab. British Central Africa. North end of Lake Nyassa, *J. Thomson*!

I. acutifolia Schinz from Great Namaqualand, which I only know from the description, is stated to have only 5–10-flowered racemes. Stems 4–8 cm. long, terete, slender, slightly hairy.

Leaves 3–4 cm. long, often about 3 mm. broad at the broadest point which is about the middle, apex mucronate, lamina strigosely hairy, petiolate, petiole ± 3 mm. long. Stipules ± 5 mm. long. Racemes many flowered, axillary, 4–5 cm. long. Rachis pubescent. Sepals linear, much longer than the tube, shorter than the petals. Standard 6 mm. long, 4·5 mm. broad at the broadest point. Keel ± 5 mm. long. Ovary linear.

G. Flowers in lax racemes, or occasionally subdense towards the apices.

* Leaves linear, subsessile.

⊙ Racemes short.

+ Legume 5–6-seeded. Racemes short, 3–4-flowered.

23. I. SIMPLICIFOLIA Lam. Encycl. iii. 251 (1789); Baker, *l. c.* p. 72; Hiern, Welw. Cat. i. p. 207.

Hab. UPPER GUINEA. Sierra Leone, *Smeathmann*! *Afzelius*! Sierra Leone, near Kambia, *Scott Elliot*, no. 4198! LOWER GUINEA. Angola, Golungo Alto, *Welwitsch*, no. 2003! Ambaca, *Welwitsch*, no. 2003 b!

++ Legume 9–11-seeded. Racemes 2–4-flowered.

24. I. POLYSPERMA DeWild. & Dur. in Bull. Herb. Boiss. 1900, p. 14.

Hab. LOWER GUINEA. Congo Region, Kisantu, *J. Gillet*, nos. 656, 736, 919.

+++ Legume 12–15-seeded. Racemes 6–12-flowered.

25. I. LEPRIEURII.

I. macrocarpa Leprieur ex Baker, *l. c.* p. 72, non Desvaux.

I. simplicifolia Guill. & Perr. Fl. Seneg. p. 173 (1833), non Lam.

Hab. UPPER GUINEA, *Perrottet*! Guinea proper, *Vogel*! *Barter*!

⊙⊙ Racemes very elongate.

26. I. BUCHNERI Taubert in Engl. Bot. Jahrb. xxiii. p. 180 (1896).

Hab. LOWER GUINEA. Angola, near Malandje, *Buchner*, no. 644.

** Leaves obovate or oblanceolate, subsessile, or shortly stalked.

Legume 2-seeded.

27. I. PRELADOI Harm. in Engler Bot. Jahrb. 1899, p. 284.

Hab. TROPICAL EAST AFRICA. Near Beira, *R. Schlechter*. Cabeceira Grande, *Prelado*, no. 20.

*** Leaves oblong or lanceolate, shortly stalked.

+ Herbaceous, with soft spreading pubescence.

⊙ Petiole 2–4 mm. Racemes 2–10-flowered. Legume 8–10-seeded.

28. I. ERYTHROGRAMMA Welw. ex Baker, Fl. Trop. Afr. ii. 73 (1871); Hiern. Welw. Cat. i. 207.

Hab. LOWER GUINEA. Angola, Pungo Andongo, *Welwitsch*, no. 2006! Loando, *Welwitsch*, no. 2007! 2005. Huilla, *Welwitsch*, no. 2008! Congo Region, Kisantu, *J. Gillet*, no. 785. EAST TROPICAL AFRICA. Opposite Zanzibar, *Kirk*.

⊙⊙ Petiole 1–1·5 cm. Racemes 15–20-flowered.

29. I. FLAVICANS Baker, *l. c.* p. 73 (1871).

Hab. SOUTH CENTRAL. In the interior near the Tropic of Capricorn, *Baines*!

An ally of *I. diphylla* Vent.

I. ACUTIFOLIA Schinz from Great Namaqualand is said to be allied to the above.

++ Shrubby, with adpressed grey bristles. Legume 8–10-seeded.

30. I. KNOBLECHLERI Kotschy in Sitzungsb. Wien Acad. 1864, p. 362; Schweinf. Reliq. Kotsch. t. 15.

Hab. NILE LAND. Banks of the Nile near Gondokoro, *Knoblechler*.

**** Leaves oval-oblong or oblanceolate, shortly stalked. Legume 3–2- or 1-seeded, hirsute.

31. I. KIRKII Oliver, Ic. Plant. t. 1416 (1883).

Hab. EAST TROPICAL AFRICA. Bagamoyo, *Kirk*! Herb. Kew.

***** Leaves broadly oval or obovate, mucronulate, glabrous above, shortly stalked. Legume 2–7-seeded.

32. I. BONGENSIS Kotschy & Peyr. Pl. Tinn. p. 8, t. 4 (1867); Baker, *l. c.* p. 74.

Hab. NILE LAND. Djurland, Prov. Dembo and at Bongo, *Heuglin;* Seriba Ghattas, *Schweinfurth*, no. 1967! Djurland, Gir, *G. Schweinfurth*, no. 1899!

****** Leaves oblong or subovate-lanceolate, finely pubescent above, subsessile.

33. I. ACHYRANTHOIDES Taubert in Engler Bot. Jahrb. xxiii. p. 180 (1896).

Hab. NILE LAND. Djurland, *Schweinfurth*, near Wau, no. 1624!

The sepals are long and linear.

******* Leaves linear-oblong, oblong or ovate-oblong, subsessile.

34. I. MICROCHAROIDES Taubert in Engl. Pl. Ost. Africa, Theil c. p. 209 (1895).

Hab. EAST TROPICAL AFRICA, without definite locality, *Fischer*, no. 288.

******** Leaves round, subovate or obovate, stalked.

⊙ Leaves blunt with a distinct mucro. Legume 4–5-seeded.

35. I. NUMMULARIA Welw. ex Baker, Fl. Trop. Afr. ii. p. 74 (1871); Hiern, Welw. Cat. i. 208.

Hab. LOWER GUINEA. Angola, Pungo Andongo, *Welwitsch*, no. 2009!

⊙⊙ Leaves obtuse. Legume 8–9-seeded.

36. I. ENGLERI.

I. saxicola Engler in Bot. Jahrb. x. 28 (1888), non F. Muell. in Benth. Fl. Austral. ii. 199 (1864).

Hab. HEREROLAND. River Swachaub, alt. 250 metres, *Marloth*, no. 1209.

Allied to *I. nummularia* Welw. and *I. ovata* Thunb. From the latter it differs by the leaves being densely hispid pilose.

Group III. Heterophyllæ.—Leaves di- or trimorphous. Simple together with sometimes conjugate, or sometimes also 3–4 foliolate, and sometimes also imparipinnate.* Inflorescence various.

A. Racemes axillary much longer than the leaves. Leaflets linear oblong.

37. I. Schweinfurthii Taubert in Engler Bot. Jahrb. xxiii. p. 181 (1896).

Hab. Nile Land. Djurland, Kutschuk Ali's Seriba, *Schweinfurth*, no. 1774. Bongoland, *Schweinfurth*, no. 4014!

B. Racemes shortly pedunculate. Leaflets oblong, obovate.

38. I. trimorphophylla Taubert, *l.c.* p. 182.

Hab. Lower Guinea. Angola, Malandsche, *Mechow*, no. 276.

C. Racemes 2–6-flowered, subsessile, abbreviated. Leaflets obovate, apex rounded, mucronate.

39. I. arenaria A. Rich.; Baker, *l.c.* p. 79; Fl. Abyss. i. 183 (1847).

Hab. Nile Land. Nubia, *Schweinfurth*. Abyssinia, *Petit*. Between Atbara and the Red Sea, *Schweinfurth*, no. 1813! Between Suakin and Berber, *Schweinfurth*, 662!

D. Racemes 2–3-flowered, subsessile, shorter than the leaves. Leaflets cuneate, obovate or oblanceolate.

40. **I. variabilis** N. E. Brown, sp. nov. Folia brevissime petiolata, simplicia vel 3-foliolata; foliola cuneato-obovata, obtusa, recurvato-apiculata, subcanescentia. Racemi 2–3-flori, subsessiles, foliis breviores. Calyx vix 1 lin. longus, lobi subulati. Corolla $2\frac{1}{2}$ lin. longa. Legumen $3\frac{1}{2}$ lin. longum, teres.

Hab. South Central. Ngamiland, Kwebe Hills, *Lugard*, 99, 199! Allied to *I. pungens* E. Mey. and *I. pulchra* Vahl., from the latter of which it differs in the much longer, ∞-seeded legume.

I am indebted to Mr. N. E. Brown for the above description.

E. Inflorescence paniculate.

* Leaflets oboval-lanceolate. Legume 2-seeded, about equal in length to the calyx.

41. I. Dupuisii M. Micheli in Th. Dur. & De Wild. Mat. fl. Congo, fasc. i. p. 9, 1897; Bull. Roy. Soc. Bot. Belg. xxxvi. 2 (1897), p. 55; Illust. Fl. Congo, t. xlix. (1899).

Hab. Lower Guinea. Congo Region, Bingila, *P. Dupuis*.

Leaves simple, trifoliolate and imparipinnate.

I have retained this plant as distinct, but find that it is very closely allied to *I. Brassii* Baker in the group of the *Paniculatæ*.

In the structure of the flower the two closely approximate, but in *I. Dupuisii* there is much more marked heterophyllism. In *I. Brassii* there is only a slight tendency to this. *I. pulchra* Vahl var. *andongensis* Hiern is also a near ally.

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* Confer also *I. bracteolata* DC., *I. sericea* Benth. forma *australis* Bak. fil., *I. suaveolens* Jaub. & Spach., *I. medicaginea* Welw., *I. trichopoda* Lepr.

** Leaflets cuneiform, oblanceolate, obtuse mucronate.

⊙ Legume 2-seeded.

42. I. PULCHRA Willd. Sp. Pl. iii. 1239 (1800); Baker, *l.c.* p. 76.
I. rufescens Poiret, Encycl. Suppl. p. 148.
I. Dorycnium Fenzl in Flora, 1844, p. 312 (nomen).
Hab. UPPER GUINEA. Senegambia, *Perrotet*! *Heudelot*! &c. Guinea proper, *Thonning*! &c. Sierra Leone, near Mahela, *Scott Elliot*, no. 4086! NILE LAND. Fazokel, *Kotschy*, no. 576! (the type of *I. Dorycnium* Fenzl). Djurland, *Schweinfurth*, ser. ii. no. 42! Seriba Ghattas, *Schweinfurth*, no. 2455! (sub *I. bracteolata* DC.). LOWER GUINEA. Loanda and Pungo Andongo, *Welwitsch*!

Var. ANDONGENSIS Hiern, Welw. Cat. i. p. 208 (1896).

Hab. LOWER GUINEA. Angola, Pungo Andongo, *Welwitsch*, no. 2047!

*** Leaflets oblanceolate, or narrow oblong, or broadly cuneate-linear. Legume 2–3-seeded, about twice the length of the calyx.

43. I. NIGRICANS Vahl ex Pers. Syn. ii. p. 327 (1807); DC. Prod. ii. p. 230 (1825).

Hab. UPPER GUINEA. Guinea, *Vahl*! Herb. Jussieu.

This plant has been somewhat misunderstood. The following notes are from a fragment of the type (in Herb. Paris) kindly sent me by M. Jules Poisson:—Caulis ramosissimus virgatus. Folia simplicia vel trifoliolata vel imparipinnata. Foliola anguste oblonga vel oblanceolata vel late cuneato-linearia præcipue subtus albido-strigosa 4–8 mm. longa, 1–2·5 mm. lata, costa superne impressa. Flores paniculati. Pedicelli ex axillis foliorum superiorum solitarii racemosi breves (vix 5 mm. longi). Calyx 3·5 mm. longus. Calycis tubus brevissimus lobi angusti-lanceolati rufo-pilosi. Legumen fusco-villosum 2–3-spermum mucronatum.

It differs from the plant described in Fl. Trop. Afr. ii. 78 (which is probably *I. elegans*) under this name in the shape of the leaflets.

E. Peduncles axillary, filiform, 1- or 2-flowered.

* Shrub. Leaflets minute, obovate, cuneate. Peduncles slender, much longer than the leaves.

44. I. CUNEATA Baker in Journ. Linn. Soc. xv. p. 92 (1876).

Hab. BRITISH CENTRAL AFRICA. Near Lake Tanganyika, *Lieut. Cameron.*

Has affinities with the *Trichopodæ.*

** Annual. Leaflets larger, obovate or oblong obovate.

45. **I. monantha,** sp. nov. Annua ex speciminibus obviis nana humilis. Radix filiformis ramosa descendens. Caulis herbaceus ramosus albi-strigosus. Folia simplicia et pinnatim trifoliolata. Foliola obovata vel oblongo-ovata modice petiolata albo-strigosa. Stipulæ lineares. Pedunculi tenuissimi filiformes 1-flori prope florem articulati. Flores inter minores generis. Calyx brevis quam flos duplo brevior externe albo-strigosus calycis lobi anguste lanceolati. Legumen rectum leviter albo-strigosum leviter lateraliter compressum mucronatum sæpissime 4–8-spermum.

Hab. British Central Africa. Fwambo, south of Tanganyika, at an altitude 5250 ft., *W. H. Nutt*! Herb. Kew.

A slender annual, in the specimens which I have seen 1–2 cm. high, allied in some respects to *I. cuneata* Baker. Leaves simple and pinnately trifoliolate; when trifoliolate the terminal leaflet is larger than the lateral, and the lateral leaflets are opposite. Leaflets 5–7 mm. long, 4–5 mm. broad at the broadest point. In the simple leaves the petiole is not as long as the lamina. Stipules linear, ± 2 mm. long. Peduncle 1–1·3 cm. long. Calyx not half as long as the flower, 1·25 mm. long. Legume nearly 1 cm. long.

*** Suffruticose. Leaflets obovate oblong, obtuse.

46. I. elegans Schum. Beskr. Guin. Pl. p. 368 (1828).

Hab. Upper Guinea. Guinea.

This is probably the *I. nigricans* described in Fl. Trop. Afr. ii. p. 78, and collected on the banks of the Niger by *Dr. Baikie*.

**** Suffruticose. Leaflets linear-obovate.

47. I. nigritana Hook. fil. in Niger Flora, 294 (1849); Baker, *l.c.* 78.

Hab. Upper Guinea. Banks of the Quorra, *Vogel*!

(To be continued.)

WAYFARING NOTES FROM THE TRANSVAAL.—II.

By R. Frank Rand, M.D., F.L.S. *

Johannesburg. Early November, 1902.—The rains which fell freely in the latter part of October have already had their effect upon the veld, which shows green in its hollows and less brown upon its uplands.

The flowers of *Xerophyta retinervis* Baker (905) have come and gone. It is plentiful upon the northern escarpment of the Witwatersrand series of rocks. The flowers of this species appear suddenly, and in a few days thereafter no more are to be found. In this district the flowering is in the late days of September and the early days of October. The anthers are very long and the connective projects, forming a blunt-pointed process at their tips. So far, search for fruit has been without success.

A considerable number of dwarf, shrubby species of *Leguminosæ*, and of other orders, bear their flowers close to the ground. Possibly this has reference to the future distribution of their fruits, for in South Africa there are many ground-feeding birds, francolins, bustard, guinea-fowl, &c., and it may be that they are the agents of seed-distribution.

Leonotis Leonurus (878) must have a very wide distribution, for

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* The numbers refer to the plants sent by Dr. Rand to the National Herbarium, where the determinations have been made, chiefly by Mr. Spencer Moore.—Ed. Journ. Bot.

it is as common in this neighbourhood as it is southwards, in many districts of the Cape, and, northwards, in Rhodesia. In the opened flower the lower lip of the corolla is always found to be withered, so that it can never function as an alighting platform, Examined in the bud, this lip is found to be whitish and delicate and folded over the stamens and style, which are bent sharply downwards. As the bud opens it shrivels and rolls downwards. Here one may note that, although a lower corollal lip does undoubtedly mostly serve as an alighting platform, yet it is possible to too hastily assume that the upright posture is as essential to insects as to ourselves. In regard to the abortive upper lip of the stigma, likewise seen in *Clerodendron triphyllum* Pears. (717), one is tempted to ask whether this may not be the result of compression of the style from close packing in the bud.

Othonna scapigera Harv. (751) is restricted to the outcrops of rock (quartz, etc., in this district). *O. natalensis* Sch. Bip. (750), with broader leaves and larger flowers, occurs upon the open veld, never among rocks. In both species there are eight ray-florets and eight involucral leaves. The ripe fruit is interesting; the involucral leaves, which, as noted in my last paper (see p. 54), partially invest the ripening achenes, bend sharply backwards, and leave the mature achenes free for dispersal by the wind.

Gerbera piloselloides Cass. (894) is remarkably woolly in all its parts. The flowers close early in the afternoon, as do other species of this genus. The bilabiate disc-florets have three little tufts of glandular papillæ upon the one lip, and one each upon the two segments of the other lip; these tufts in the unopened floret interlock. The anthers are firmly coherent; the pollen comparatively scanty. The pollen-grains, dark-coloured, lenticular, and of smooth surface; a lighter line, median and longitudinal, separates the two lateral darker portions of the grain. The portion of the fruit destined to serve as "beak" is, in the flower, only scantily furnished with hair; the lower, seed-bearing portion of the achene has it in plenty.

In *Dimorphotheca Barberiæ* Harv. (749) the flower is held conspicuously erect. After fertilization and during the maturation of the fruit the head droops heavily, almost, in some instances, to the ground, for the sap-laden, winged achenes are of considerable weight. Upon maturation the head is again held erect, and this immediately before the dispersal of the achenes. This seems to be due to the drying-up of the ripe fruits, whereby their weight is greatly diminished, and also to the shortening and partial drying of the upper portion of the peduncle, which in addition becomes fistulous for a short distance below the head. Upon seeing the heavily-drooping unripe head it is difficult to believe it can again assume the upright position, yet it does.

Callilepis leptophylla Harv. (761) was scarce in September, but came out in abundance in October. It shows very clearly the bracteolar nature of the scales of the receptacle. Each disc-floret has a scale, with reddish, dry tip, lying to its outer side, and on proceeding outwards one finds that the corresponding bracteoles of

the ray-florets constitute the bulk of the involucre (as involucral scales). The receptacle is conical and firm; the upper portion of the peduncle hollow. Most of the examples have a dark centre with ray of a creamy-white, but examples with ray and disc both cream-coloured are common. The anthers of this species have tails furnished with straggling, glandular hairs.

The ripe fruit of *Berkheya seminivea* Harv. & Sond. (895) has its feathered pappus arranged quite like the feathers of a shuttlecock. In *Helichrysum fulgidum* Willd. var. *monocephalum* (741) the tips of the pappus-hairs are not barbed, but terminate in several longish, swollen, pointed processes.

In *Gazania Krebsiana* Less. (756, 757) it is the uppermost layer of the involucre which almost exclusively in these species presses firmly in upon the ray-florets during the closure of the flower. The outer surface of the leaves of this row are shiny and varnished-looking; their edges incline to be membranous. They have a broad fleshy attachment at the base, and incline to fleshiness along the median line, where they are green, their edges being dark-coloured and their tips unwithered.

Lopholæna Randii S. Moore (746) (see p. 133) grows among the rocks, to which situations it appears to be confined. It is very conspicuous when the seeds are ripe. The pappus is waved. The upper part of the corolla-tube is urceolated, and, as is usual in that condition, the anthers have no tails. In the unopened floret there are two curved bends upon the filament. The filament-body—I know of no other means of denoting the differentiated part of the filament—seen in so many Composites, shows as a bulbous swelling. A similar swelling of the filament is to be seen in a Polygala sent.

The woolly under-surface to the leaf, seen in so many Composites, and so strikingly in the case of those with exclusively radical leaves, while controlling transpiration, must also, in the latter case, be a strong protection from the cold ground in a climate such as this, where terrestrial radiation is very great. In this connection the thick woolly covering around the foot of the peduncle, seen in several species sent, is noteworthy.

Gladiolus Woodii Baker (902) and another species (903) were the only Gladioli found.

Canthium Mundtianum Cham. & Schlecht. (882).—The hairs in the throat of the corolla have an interesting character. Opposite the line from which the stamens spring, there is, in the newly opened flower, a shed or parting; above the shed the hairs are directed upwards, below it they are directed downwards. Both series are of equal length. These hairs are simple in some species, jointed and moniliform in others.

In *Gnidia*—various species—the involucre is protective during the maturation of the fruit. When ripe it opens out, allowing the hair-covered fruits to be dispersed by the wind. They recall the Composites in several of their features.

Cycnium adonense (879).—The hairs of the staminal beard are very beautiful; they are tapered, moniliform, arranged as a brush, and restricted to the inner face of the filament.

Kiggelaria africana ♂ (834).—All parts of the plant densely hairy with stellate hairs, even the anthers. The filaments, however, bear none, and there are none upon the petallar glands. Both external and internal faces of the petals are hairy, and the pollen-grains cling in great numbers to the inner face. This, together with the presence of nectaries, would appear to point to this species being entomophilous. The stellate type of hair is probably a most economical method of giving a closely-felted covering. Two species of *Hermannia* (*H. tomentosa* Schinz (660) and *H. depressa* N. E. Br. (661)), furnish further examples.

Justicia anagalloides T. And. (718).—The lower, barren anther appears to function as a trigger. The upper, fertile one has its tip turned downwards and through its orifice, which rather resembles the spout of a coffee-pot; the pollen is discharged in a downward direction. As the trigger is likewise directed downwards, little pollen is ejected upon entry; but when a suitable insect leaves, the trigger is pushed upwards, when, upon its release, the recoil causes a cloud of pollen to be shot upon the insect's back. As the filament has its attachment upon the outer side of the anther, midway between the upper fertile lobe and the lower trigger-like one, the anther swings around its point of attachment as upon a horizontal axis.

Harveya Randii Hiern* (722).—The corolla is firm and fleshy, of a vivid rose-red colour. The bunched tufts of these flowers are very bright and conspicuous. The host is a small moss-like Composite. The style stands back in a recessed portion of the corolla-tube, and the large bilobular stigma arches forward, overhanging the stamens. The two anthers of each pair of stamens are lightly adherent where their inner faces touch. The lower barren half of the anther is very large, and doubtless serves as a trigger, as seen in *Justicia anagalloides*.

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* **Harveya Randii** Hiern, sp. n. Herba firma humilior ad radices stirpium parvarum Compositarum? de quibus facile detrahenda parasitica, caule brevi obsoleto vel sub-pollicari carnoso dense squamigero, foliis veris nullis, squamis late ovalibus vel subrotundis apice rotundatis basi latis sessilibus integerrimis subcarnosis in sicco fuscis extra viscido-puberulis intus mollibus ad caulem appressis 1·25–6 mm. longis 2–4 mm. latis, floribus pluribus crebris sessilibus vel subsessilibus roseo-purpureis speciosis plus minus 44 mm. longis, bracteâ solitariâ ovali concavâ sessili in sicco fuscâ apice rotundatâ extra viscido-puberulâ intus molli 12·5 mm. longâ 6 mm. latâ, bracteolis 2 linearioblongis obtusis sessilibus in sicco fuscis extra viscido-puberulis intus mollibus 15·5–17 mm. longis 2–2·5 mm. latis erectis prope calycis basim insertis liberis, calyce campanulato-oblongo laxo 5-fido 22 mm. longo in sicco fusco extra glanduloso-pubescente intus molli, lobis erectis vel suberectis lanceolato-oblongis obtusis 9–11 mm. longis eorum duobus altius connatis, corollæ tubo cylindrico-infundibulariformi carnoso-membranaceo plus minus sesquipollicari vertice 10·5–12·5 mm. diam. extra glanduloso-pubescente intus glabro deorsum quam calyx angustiore, limbo patulo 21–31 mm. diam. inferne ciliolato ceterum glabro, lobis 5 obovato-rotundis margine undulato-crenulatis 8–10·5 mm. longis 9–11 mm. latis, staminibus 4 didynamis inclusis, antheris glabris bi-locularibus loculo longiore anguste acuminato, filamentis glanduloso-puberulis, stylo subglabro corollæ tubum æquante stamina excendente apice deflexo, stigmate dilatato apice inæqualiter bilobo.

Hab. "About Johannesburg, upon stony hills, where it forms brilliant patches of colour, September, 1902," *R. F. Rand*, n. 722.

W. P. H.

The Asclepiads call for special mention. As each week goes by fresh ones appear. I have thought that a few memoranda of observations made upon those growing in this locality might be of interest. The remarks apply only to the species occurring in this district. Taking K. Schumann's division of the order, two species, Nos. 861 and 711 of Division I. *Periplocoideæ*, occur. Of Division II. *Cynanchoideæ*, the remainder sent in this consignment belong exclusively to the *Asclepiadeæ* section.

In the *Periplocoideæ* the spoon-like translator, destined, by means of its sticky disc, to attach itself to the head of an insect, goes with a relatively simpler structure of the flower. In the *Asclepiadeæ* the forceps-like translator, destined to attach itself to the leg of an insect, clasping it as in a vice, goes with a widely differing structure of the flower, altered to meet the different mechanism involved.

Raphionacme divaricata Harv. (861).—First found growing among rocks, but also later upon the open veld. The calyx small. The corolla with ovate-lanceolate lobes, greenish without, bright purple within. Cuculli white or slightly tinged with purple, coming up and overlapping the stylar head, so that access to the anthers is only possible by way of the intervals left between adjoining cuculli. The cuculli are broader above, 3-lobed, overlapping each other in imbricate fashion upon the stylar head. They are thick in the median line, with a slender incurved horn at each of the two upper corners, while the central lobe bears a thong-like process at its tip, which quickly withers. Anthers and style are not fused into a column as in the *Asclepiadeæ*, but the two styles swell into a globose head, around which the anthers lie side by side in a ring, their tips shrivelled, but not membrane-tipped. The filaments are simple, slender and free from the point at which they spring from the corolla. There is nothing of the anther-valve mechanism of the *Asclepiadeæ*. The anther-loculi open laterally where the pollen-tetrads are received upon what corresponds to the bowl of the spoon. The spoon in this species has a double S-like curve recalling a shoe-horn. The handle lies below, and is tipped at its lower end by the sticky disc.

Raphionacme Galpini Schlecht. (711).—The corolla is green. The cuculli are flattish ; above they are prolonged in their median lines into filamentous processes, which arch over the stylar head in a cage-like framework, as one sees the corolla-lobes do in *Ceropegia*. These processes are covered with glandular warty emergences and probably secrete honey, as one finds sticky, dewy beads upon them. The spoon-shaped translator has a long and narrow "handle," and the "bowl" of the spoon is turned inside-out, so that the pollen-tetrads are shed upon a convex surface.

In neither of the foregoing species does the stylar head break away easily from the ovaries as it does in the *Asclepiadeæ* examined; nor are the carpels easily separable. They form a single stout purely stylar column, and the stigmatic surface appears to be at the apex of the stylar head.

Coming to the *Asclepiadeæ*, where the mechanism is of so

different a character, the examples sent are more numerous. In general one notes the fusion of anthers and stylar head into a column. The corpusculum of the translator set between each pair of adjoining anthers, joined to the pollinia of adjacent anthers, mostly by means of retinacula. Below the translator, in all the species sent, lies the slit left between the valve-like sides of adjacent anthers. These lateral valve-like projections of the anthers, in some species, project saliently below, forming a wing or keel, and then retreat more or less suddenly in a horizontal direction back to the column. The two valves diverge, leaving an opening whose shape varies with that of the pollinium to be encountered, and beyond the dilatation the valves again approach so as to leave a mere slit, as in their upper vertical portions. The result is a split-ring-like device or spring enabling the orifice to close tightly upon an included pollinium, brought from another flower. Within the anther-slit, and lying enclosed between the anther-valves which form the outer walls, is a cavity more or less lenticular in section, reaching, in the lower portion of cavity, almost to the ovaries. The valves are frequently smooth and horny upon their outer faces and sometimes dark-coloured. In No. 862 the inner margin of the lips of the slit is beset with fine teeth directed upwards and inwards. The anthers are provided, almost universally in the *Asclepiadeæ*, with membranous tips. I have little doubt their function is to provide a slippery surface for the insect-foot, which slips and slides down from them to be snared in the slits between the anther-valves below. These membranous tips are not found in the *Periplocoideæ*, where the mechanism is addressed to distribution by the head of the insect.

The pollinia vary much in shape and size in the different species. Sometimes the flattening is so great that the pollinium has the shape of a fly's wing. Sometimes there is a keel-like process. The retinacula vary very much in length and thickness, while in some cases the pollinia are practically sessile upon the corpusculum. When a pollinium is deposited within the anther-valves it becomes cloudy. As only one of the pair of pollinia can find entrance between the valves, the other one is left projecting and is probably wasted, breaking away from the imprisoned pollinium and carrying the corpusculum with it. It may be interesting therefore to note it is the product of one anther, and not of two, which fertilizes. The corona and its constituent cuculli vary so greatly in form that it is difficult to find objects with which to compare them. Perhaps if each cucullus were regarded, merely for descriptive purposes, as the lamina of a leaf, one might better indicate its divisions, its outgrowths, its varying thicknesses, and the twists and turns of its margins and marginal processes. That the cuculli frequently function as nectaries is obvious, but they frequently form gateways or avenues of approach to the anthers, by apposition of notches in adjoining cuculli, or by the mutual approach of adjoining cucullar processes. Doubtless these processes often bar the way to unwelcome insect-visitors. In the later stages of the flower the cuculli, when long, unusually fold up over the stylar head.

Appended are a few points which seemed to call for special mention in the species of *Asclepiadeæ* sent:—

Asclepias stellifera Schlecht. (*Gomphocarpus revolutus* Decaisne) (704).—The first species collected. Flowers mostly dull-purple, but sometimes of a pale flesh-colour. Very plentiful. Frequently has four flowers to the umbel. The follicles held erect, and the stalk usually spirally coiled.

A. aurea Schlecht. (703) appears a little later than the preceding, has usually only four flowers to the umbel.

A. Schinzianus Schlecht. (862).—The flowers large, nearly an inch in diameter, of dull whitish colour; the cuculli with a broad purple median patch. Anther-valves conspicuous and projecting strongly below. Pollinia very large, rudely ovoid. Lips of the anther-slits smooth externally, but within are set with a row of small upturned teeth. Beetles and even bees are often held permanent prisoners by these slits, of which examples, now drying, will be sent in the next consignment. The insects in some cases were still living, but the majority were dead. A spider, whose dull whitish colour exactly matches that of the flower, often lurks within it.

Schizoglossum nitidum Schlecht. (863).—The pollinia are very large as compared with the size of the flower. In an example examined a pollinium was found held in the anther-clips, the bulk of it projected outside. The pollinium is not much flattened; at its broad end it has a hook-like process which does not stand free, but is connected with the main body of the pollinium by a membranous expansion, so as to form a flange or keel, this portion being apparently free from pollen, yet in the example examined it was this keel-like process which was held fast between the anther-valves. In this and in other cases this keel appears to be a special structural feature of the pollinium, adapting it to enclosure by the particular anther-valves in view. In the flower-bud of this species the tips of the green petals are turned downwards over the stylar head (which, however, they do not touch), so as to form a well-marked dimple. In the opened flower the margins of the petals are recurved.

Gomphocarpus fruticosus (859).—A shrubby weed, common in waste places. The thin everted edges of adjoining cuculli form slits, which directly overlie the slits formed by the anther-valves.

Sisyranthus Randii S. Moore * (856).—The corolla is shortly

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* **Sisyranthus Randii** S. Moore, sp. n. Caule elongato ascendente gracili tereti glabro sparsim ramoso ramis prolixis cauli parallelis, foliis sparsis elongatis angustissime linearibus obtusis pilosiusculis marginibus saltem in sicco revolutis, cymis interpetiolaribus umbelliformibus paucifloris, pedunculis gracillimis quam folia brevioribus pilosiusculis, bracteis setaceis pilosis quam pedicelli, flores excedentes, multo brevioribus, calycis lobis corollæ tubum excedentibus lanceolatis longe acuminatis extus pilis strigosulis appressis præditis, corollæ paullulum carnosulæ urceolato-campanulatæ intus glabræ vix adusque medium lobatæ lobis erectis deltoideis vel deltoideo-oblongis obtusis marginibus decoloribus, coronæ squamis gynostegium paullo superantibus ovatis erectis carnosulis basi 2-denticulatis, polliniis pyriformi-subquadratis caudiculis perbrevibus fultis, glandula anguste oblonga.

campanulate. The pollinia are attached by one end directly to the corpusculum. At the free end each pollinium has a projecting wing or keel lying in the median line between the two faintly-indicated lobes of its mass. This keel is thicker and darker in colour along that portion of its margin most distant from its line of origin. It is doubtless a structural adaptation to the anther-valves which are destined to retain it—as in *Schizoglossum nitidum*. Several other species have been collected and are now drying; I hope to refer to them in a later note.

Note in Correction.—Closer acquaintance with Asclepiads has shown me that I must have manipulated clumsily in the case of the Gomphocarpus, mentioned (p. 54) as having been met with upon Table Mountain; for I see that I must have removed the pollinia of the flower dealt with. Once a pollinium is safely lodged within the stigmatic cavity, the case in one of *j'y suis, j'y reste*. Having delivered the pollinia and scraped its legs free, which beetles and bees, as several tragic examples already sent will have shown, do not always succeed in doing, the insect may drag out the pair of pollinia surmounting the slit in which it has already deposited outside pollinia. This is not usual, however, as I have repeatedly found the pollinia in position over a slit from which one imported pollinium projected, the fertilizing one of the pair being enclosed within the slit.

Referring to Composites and the urceolation of the corolla-tubes of the disc flowers (p. 53), it is where the urceolation of the tube is confined to that portion of the tube opposite the anthers that it is rare to find anther-tails.

Hab. Open veldt to the westward of Johannesburg, Oct. 1902; *R. F. Rand*, 856. (Also Riet Vlei, Natal; *Harold Fry*, Herb. Galpin, 2737 in Herb. Kew.)

Herba 60·0 cm. attigens. Caulis deorsum 0·2 cm. sursum 0·1 cm. diam., in longitudinem pluristriatus. Folia infima abbreviata, circa 1·0 cm. long.; modica 6·0–13·0 cm., in sicco (sc. marginibus revolutis) 0·06 cm. lat., graminoidea. Cymæ solemniter 5-floræ, paullo ultra 1·0 cm. diam. Pedunculi 4·5–5·0 cm. long., juveniles vero breviores; pedicelli ± 1·0 cm. et bracteæ 0·3–0·4 cm. long. Calycis lobi in toto 0·4 cm. long., horum acumen 0·2 cm. Corolla viridis humectata 0·5 cm. diam.; lobi 0·25 cm. long. Coronæ squamæ ægre 0·2 cm. long., 0·13 cm. lat., læte virides. Pollinia 0·04 cm. et glandula 0·03 cm. long.

Var. *abbreviata*. Folia breviora, summum 7·0 cm. long. Pedicelli modo 2·0–2·5 cm. pedunculi 0·3 cm. long. Calycis lobi quam corollæ tubus breviores, glabri.

Hab. With the type, and sent under the same number.

Easily recognized by the nearly glabrous stem and leaves, the long peduncles, the 5-flowered cymes, and the corollas with broad white-edged lobes.

NORFOLK NOTES.

By Arthur Bennett, F.L.S., & C. E. Salmon, F.L.S.

The following notes are partly those made by Mr. C. E. Salmon in May, 1902, and partly extracts, &c., to bring together as much as possible information scattered in various publications, &c. The first-named writer has collated the localities in Trimmer's Flora, the Supplement, the Transactions of the Norfolk & Norwich Nat. Hist. Society, and Mr. Linton's Notes in this Journal; with Mr. S. P. Woodward's paper "On the Flora of Central Norfolk" (Ann. & Mag. Nat. Hist. vii. 202–205, 1841), with R. J. Mann's Fl. Central Norf. (Mag. Nat. Hist. iv. 390–407, 1840), and with G. Munford's "List of Flowering Plants in West Norfolk" (Ann. & Mag. Nat. Hist. viii. 171–191, 1842). He finds there are numerous localities, in all three lists, that are not taken up by any of the later publications; *viz.* in the first about 70, in the second about 32, and in the last about 18; these will have to be taken into account in any future flora of Norfolk. The localities are in v.-c. 27, East Norfolk, unless otherwise noted.

Fumaria densiflora DC. Sutton.—*Papaver hybridum* L. Sutton.

Cardamine amara L. Wroxham; Horning Ferry.—*Cochlearia officinalis* L. Abundant by Meadow Dike, Heigham Sounds.—*Sisymbrium officinale* Scop. var. *leiocarpum* DC. Ant-bank near Barton Turf.—*Nasturtium palustre* DC. Barton Turf.

Frankenia lævis L. Yarmouth, 1800; Sir T. Gage in herb. Dalton at York.

Stellaria palustris, Retz. Wood Marsh, Stalham.

Geranium striatum L. Roadside near Horsey.†

Lathyrus palustris L. Abundant on both banks of the Bure close to Ranworth Dike.

Pyrus Aucuparia. Wood Marsh, Stalham.

Drosera rotundifolia L. Thurne.—*D. intermedia* Hayne and *D. anglica* Huds. Ranworth; Power herb. ! at Reigate.

Montia repens Pers. Plentiful at Horsey Gap.

Ribes nigrum L. Thurne.

Tillæa muscosa L. Near Norwich, 1798; Sir J. C. Smith in herb. Dalton. Near Yarmouth, Dalton, *l. c.*

Hippuris vulgaris L. Meadow Dike. Ditch near Horsey Mill.

Apium graveolens L. Near Horsey Mill.—*Anthriscus vulgaris* Bernh. Very common at Wroxham and Belaugh; Neatishead.—*Peucedanum palustre* Moench. Great Fen; Barton.—*Cicuta virosa* L. Great Fen; Barton; Ranworth.

Galium anglicum L. Outwell Churchyard-wall; Deakin, Florigr. Brit. i. 185. Part of this parish is in Cambridgeshire, but the church is in Norfolk; Babington, Fl. Camb. 110, 1860. Norwich; Rev. J. Dalton, 1830, in herb.

Carduus pratensis. Barton; Great Fen; Wood Marsh, Stalham.—*Taraxacum udum* Jord. Blackfleet Broad, near Horsey.

["*Hypochæris glabra* L." Ditchingham, Sept. 1846, D. Stock in Herb. Brit. Mus., is *Crepis virens*.]

Pyrola minor L. Hempstead Holt, June, 1893; H. D. Geldart. —*P. rotundifolia* L. Felthorpe, July, 1902; herb. Geldart. Grimstone (West Norfolk, 28); Mr. Bray to H. D. Geldart. Thurne; Miss Daire. Stow Mere, Shropham (v.-c. 28); Adam When, L.P.W.; Miss Geldart to Mr. Southwell.

Gentiana campestris L. "On the river bank at about two miles below Wisbech"; J. Balding in Bab. Fl. Camb. 152.

Verbascum pulverulentum Vill. × *nigrum* L. A little way out of Brancaster by the roadside (v.-c. 28); W. West, jun., sp.—*V. pulverulentum* Vill. "About the ditch on the outside the city walls at Norwich; also by the river Yare, between Bishopsgate Bridge and the ferry-house, both places plentifully," S. Alchorne; see Phytol. iii. 168, 189 (1848). — *Pedicularis palustris* L. Blackfleet Broad, near Horsey.

Stachys germanica L. "In several places in Norfolk;" Syme, Eng. Bot. vii. p. 56. We have been unable to find any definite record of this plant for the county. It appears in Comp. Cybele Brit. p. 276 (1870), but in both editions of Top. Bot. it is placed in square brackets. It is not named for the county in either of the Botanists' Guides, or by Smith; neither does Mr. Geldart mention it in his list of Norfolk plants in Trans. Norf. & Norwich Nat. Hist. Society, 1874–5. There is no record for Norfolk in Mr. Watson's MS. materials for Top. Bot. preserved in the National Herbarium.

Myosotis versicolor Reichb. Barton Turf.

Hottonia palustris L. Belaugh; Barton Turf; Wood Marsh, Stalham.

Salicornia radicans Sm. Hunstanton, July, 1899; F. T. Mott in herb. Jackson!

Rumex limosus Thuill. In a pond between Hickling and Catfield.

Daphne Mezereum L. Edgefield Heath (though probably a part of the Lowes); it is in the parish of Edgefield. This part of the heath is private property belonging to Edgefield Hall Estate. "Thirteen patches were seen varying from 1 foot to 4 feet high, in all about 100 spikes of flower"; Mr. W. H. Burrell to Mr. H. D. Geldart.

Urtica pilulifera L. "About the walls of Yarmouth, Norfolk," S. Alchorne; see Phytol. iii. 190.

Salix acuminata Sm. Saham and Tuck's Wood; herb. Smith!

Orchis incarnata L. Thurne.

Stratiotes aloides L. Barton Turf.

Potamogeton coloratus Hornm. Ditch at Meadow Dike, near Horsey.—*P. alpinus* Balb. River at Santon; Rev. Dr. Hind!

Scirpus pauciflorus Lightf. Swamp near Thurne, — *Carex teretiuscula* Good. Swamp near Thurne. — *C. paradoxa* Willd. Great Fen, near Barton Broad; Barton; Wood Marsh, Stalham. These make five localities for this *Carex* in the county; at Ranworth it occurs in great abundance, growing with a pretty small form of *C. Hudsonii* and *Liparis*.—*C. intermedia* Good. Barton Turf; Great Fen. — *C. pulicaris* L. Great Fen; Barton. — *C. limosa* L. Swamp near Thurne. — *C. Hudsonii* Ar. Benn. (*C. stricta* Good.). By river Thurne, near Thurne.—*C. acuta* L. Ranworth; Thurne;

Wroxham. — *C. filiformis* L. Great Fen; Barton; Ranworth; Wood Marsh, Stalham. — *C. rostrata* Stokes. Wood Marsh, Stalham.—*C. curta* Good. Marsh below Blackfleet Broad. Now known in four stations in the county.

Spartina stricta Roth. Near Lynn; F. J. A. Hort in Bot. Gaz. ii. 54 (1850).

Lastrea Thelypteris Presl. Great Fen; Barton.—*Osmunda regalis* L. Wood Marsh, Stalham; sparingly for some mile or so between Heigham Sounds and Waxham.

Ophioglossum vulgatum L. Blackfleet Broad; Great Fen; Barton; Wood Marsh, Stalham.

Chara polyacantha Braun. Blackfleet Broad, in great beds many yards across, and so dense in places as to prevent a boat from proceeding; this being a private broad, there is every opportunity for aquatics to grow, as there is scarcely ever any traffic on it. Horsey Mere. — *Lychnothamnus stelliger* Braun. From Martham Broad to Hickling Staithe, on one side, and from Heigham Bridge to Horsey Mere it is scarcely possible for any distance to avoid bringing up this species; its numbers are immense, though generally smaller than at Filby Broad, where specimens in good fruit may nearly always be obtained.

INFECTION-POWERS OF ASCOSPORES IN ERYSIPHACEÆ.

By Ernest S. Salmon, F.L.S.

(Concluded from p. 165.)

In Exper. no. 10 ascospores were sown, on April 16th, on *Hordeum vulgare* (6 plants, twelve days old), and on *H. maritimum* (3 plants, twenty days old). The inoculated plants of *H. vulgare* were in two pots. In one pot the control leaves were well separated from the inoculated ones, and the plants were kept covered under a glass beaker for the first eight days of the experiment. On April 21st each of the three inoculated leaves bore several patches of mycelium with vigorous tufts of young conidiophores; the control plants (twelve in number) were all free. On April 22nd one of the infected leaves bore three patches of mycelium with groups of almost ripe conidiophores; the second leaf bore six patches of mycelium with young conidiophores; and the third bore one similar patch. On April 24th all the inoculated leaves bore vigorous *Oidium*-patches with powdery masses of spores; the controls were still quite free. At this date the glass beaker was removed, and the plants exposed to the air of the greenhouse. By April 27th two flecks of mycelium had appeared on the control plants; and by April 30th most of the control plants were infected. In the other pot of *H. vulgare* the plants were not sufficiently separated to preclude the possibility of the inoculated and the control leaves brushing against each other in their rapid growth under the glass beaker. Further, on April 19th, the glass beakers over this

pot of *H. vulgare* and the pot of *H. maritimum* were raised to the level of the top of the pot. Through this ventilation currents of air, very probably carrying floating spores, would reach the plants. On April 21st several flecks of mycelium were observable on two of the inoculated leaves. On April 22nd these two inoculated leaves bore numerous groups of young conidiophores; a small fleck of mycelium had now appeared on one control plant. On April 24th the three inoculated leaves bore respectively twelve, three, and two patches of vigorously growing mycelium with groups of nearly ripe conidiophores; the one control leaf bore a small patch of mycelium with young conidiophores. The plants in these two pots were now entirely uncovered, and exposed to the air of the greenhouse. On April 27th the three infected leaves bore very numerous patches of *Oidium* with powdery masses of spores; two control plants bore several patches of mycelium with groups of young conidiophores. On April 30th most of the control plants had become infected. No trace of infection occurred on any plants of *H. maritimum* during the course of the experiment.

At the time of this experiment the greenhouse—a small one—contained the numerous plants of barley, now covered with densely powdery patches of *Oidium*, used in the previous experiments. In order to ascertain to what extent the conidia were carried about in the currents of air, a number of glass slides, smeared over with glycerine, were suspended from the roof at a little distance over the shelves—both over the shelf on which the *Oidium*-covered plants were, and over that on which other inoculated plants under glass beakers stood. After forty-eight hours the slides were examined, and a considerable number of conidia—germinating feebly in the thick glycerine—were found adhering to the slides suspended over both shelves. It is evident, therefore, that in the later experiments the plants, on ventilation being given to the pot by the lifting or removal of the glass beaker, were exposed to the risk of infection from air-borne conidia.

In Exper. no. 11 ascospores were sown, on April 17th, on plants of *H. vulgare* fourteen days old, of *Hordeum secalinum* ten days old, and of oats fourteen days old. Three leaves were inoculated in each pot. Many of the ascospores at the time of sowing had put forth short germ-tubes. With regard to the *H. vulgare*, on April 22nd two of the inoculated leaves showed minute flecks of mycelium. On April 24th the three inoculated leaves bore respectively ten, three, and two vigorous patches of mycelium, which in several cases had produced tufts of conidiophores with small powdery masses of spores. All the control plants—twelve in number—were quite free. On April 27th all the infected leaves bore very numerous *Oidium*-patches with powdery masses of spores which flew off in clouds on the plants being touched. At this date the glass beakers were removed. On April 30th all the inoculated leaves were still covered with luxuriant patches of *Oidium*; a few minute flecks of mycelium had appeared on the control plants. On May 3rd more of the controls were infected, and on May 6th the fungus had spread to nearly all the plants in the pot. No trace

of infection appeared on any of the plants of *H. secalinum* or of oats.

In Exper. no. 12 (April 17th) the same series of inoculations was made. On April 22nd the three inoculated leaves of *H. vulgare* bore respectively fifteen, four, and two vigorous patches of mycelium; by April 24th the leaves bore sixteen, ten, and five vigorous *Oidium*-patches with powdery masses of spores. The control plants were all quite free. The glass beakers were at this date removed from all the pots. On April 27th the three infected leaves bore luxuriant powdery *Oidium*-patches; the controls were still all free. On April 30th the fungus had spread to most of the plants in the pot. No trace of infection occurred on *H. secalinum* or on oats.

In Exper. no. 13 (April 18th) three plants of *H. vulgare* (nine days old), four plants of *H. secalinum* (eleven days old), and three plants of *H. maritimum* (twenty-two days old) were inoculated. With regard to *H. vulgare*, infection had resulted on two of the inoculated leaves by April 24th. On April 27th these two leaves bore patches of *Oidium* with powdery masses of spores. By April 30th the fungus had spread to most of the controls. No infection resulted on *H. secalinum* or on *H. maritimum*.

In Exper. no. 14 (April 29th) plants of *H. jubatum* (twenty days old), *H. vulgare* and *H. bulbosum* (six days old), were inoculated,—three plants in each pot. With regard to *H. vulgare* two of the inoculated leaves bore, on May 6th, numerous flecks of mycelium with young conidiophores; all the control plants were quite free. On May 8th the two leaves bore almost powdery *Oidium*-patches. On May 14th the *Oidium*-patches were powdery with masses of spores; the controls were still quite free. On May 16th the fungus had begun to spread to the controls. No trace of infection appeared on any of the plants of *H. jubatum* or *H. bulbosum*.

In Exper. no. 15 (April 30th) three plants each of seedlings (seven days old) of *H. secalinum* and *H. vulgare* were inoculated. On May 6th the three inoculated leaves of *H. vulgare* bore respectively fourteen, ten, and three flecks of mycelium, most of which bore groups of young conidiophores; the control plants (nine) were all quite free. On May 8th all the inoculated leaves bore numerous and vigorous *Oidium*-patches with powdery masses of spores; the controls were still all free. On May 11th a fleck of mycelium was observed on one control plant; by May 16th the fungus had spread to most of the plants in the pot. No trace of infection appeared on any of the plants of *H. secalinum*.

In Exper. No. 16 (May 7th) three plants each of *H. Zeocriton*, *H. trifurcatum*, *H. bulbosum* (nine days old), and *H. vulgare* (fourteen days old) were inoculated. On May 14th flecks of mycelium, some with groups of young conidiophores, were visible on the inoculated leaves of *H. Zeocriton* (three leaves), *H. trifurcatum* (two leaves), and *H. vulgare* (three leaves). On May 16th these infected leaves of the three species bore *Oidium* patches with powdery masses of spores; all the controls in each pot were free. On May 18th the six inoculated leaves in the pots of *H. Zeocriton* and *H. vulgare* bore numerous patches of *Oidium* with powdery masses of spores; the

fungus was beginning to spread to the controls. Of the inoculated leaves of *H. trifurcatum* two bore small powdery *Oidium* patches; the controls were all still free. No trace of infection resulted on *H. bulbosum*.

Summary of Infection-experiments with the Ascospores of E. Graminis on Hordeum vulgare.

Exper. No.	Date, 1903.	Species used as Host.	Age of plants inoculated.	No. of leaves inoculated.	No. of leaves infected.	Length of time perithecia supplying the ascospores had been kept damp.
1 a	March 19	*Avena sativa*	8 days	3	0	3 days
4 c	,, 31	,, ...	12 ,,	3	0	4 ,,
7 b	April 3	,, ...	15 ,,	3	0	7 ,,
11 c	,, 17	,, ...	14 ,,	3	0	6 ,,
12 c	,, 17	,, ...	14 ,,	3	0	6 ,,
1 b	March 19	*Triticum vulgare*	8 ,,	3	0	3 ,,
4 a	,, 31	,, ...	12 ,,	3	0	4 ,,
5 c	April 1	,, ...	13 ,,	3	0	5 ,,
1 c	March 19	*Secale cereale*	8 ,,	4	0	3 ,,
3 b	,, 31	,, ...	12 ,,	2	0	6 ,,
5 b	April 1	,, ...	21 ,,	3	0	5 ,,
6 b	,, 2	,, ...	22 ,,	3	0	6 ,,
3 a	March 31	*Hordeum vulgare*	12 ,,	3	3	6 ,,
4 b	,, 31	,, ...	12 ,,	3	3	4 ,,
5 a	April 1	,, ...	13 ,,	3	3	5 ,,
6 a	,, 2	,, ...	14 ,,	3	3	6 ,,
7 a	,, 3	,, ...	15 ,,	4	4	7 ,,
10 a	,, 16	,, ...	12 ,,	6	6	4 ,,
11 a	,, 17	,, ...	14 ,,	3	3	6 ,,
12 a	,, 17	,, ...	14 ,,	3	3	6 ,,
13 a	,, 18	,, ...	9 ,,	3	3	7 ,,
14 b	,, 29	,, ...	6 ,,	3	2	6 ,,
15 b	,, 30	,, ...	7 ,,	3	3	7 ,,
16 f	May 7	,, ...	14 ,,	3	3	5 ,,
10 b	April 16	*H. maritimum* ...	20 ,,	3	0	4 ,,
13 c	,, 18	,, ...	22 ,,	3	0	7 ,,
11 b	,, 17	*H. secalinum*	10 ,,	3	0	6 ,,
12 b	,, 17	,, ...	10 ,,	3	0	6 ,,
13 b	,, 18	,, ...	11 ,,	4	0	7 ,,
15 a	,, 30	,, ...	7 ,,	3	0	7 ,,
14 a	,, 29	*H. jubatum*	20 ,,	3	0	6 ,,
14 c	,, 29	*H. bulbosum*	7 ,,	3	0	6 ,,
16 g	May 7	,, ...	9 ,,	3	0	5 ,,
16 b	,, 7	*H. Zeocriton*	9 ,,	3	3	5 ,,
16 e	,, 7	*H. trifurcatum* ...	9 ,,	3	2	5 ,,

The experiments above tabulated seem to give conclusive evidence that *E. Graminis* comprises in its ascigerous stage specialized "biologic forms." Hitherto that specialization of parasitism which

results in the evolution of "biologic forms" has been known in the *Erysiphaceæ* only in the conidial stage of certain species. Now that the fact is established that "biologic forms" show the same kind of restriction in the infection-powers of the ascospores as in those of the conidia, it becomes apparent that we must recognize the claims of "biologic forms" to be considered as distinct entities. It is obvious, too, that before we can fully understand the exact position in nature of any morphological species which is parasitic on a number of host-plants, and is composed of a number of "biologic forms," we must investigate the phenomena of specialized parasitism shown in the restricted infection-powers of the ascospores and conidia of each "biologic form." For instance, in the case of the morphological species, *Erysiphe Polygoni* DC., which grows on 400 species belonging to 160 different genera of host-plants, it remains to be seen whether it consists of as many "biologic forms" as there are genera of host-plants, or otherwise.

In the present case of the "biologic form" of *E. Graminis* on *Hordeum vulgare*, the ascospores seem unable to infect wheat, oats, rye, *Hordeum maritimum*, *H. secalinum*, *H. jubatum*, and *H. bulbosum*.

The possibility must not be lost sight of, however, that this "biologic form" may be able to infect certain other species of grasses, and from these pass on to wheat, oats, &c. When working with the *Oidium* of *E. Graminis* on species of *Bromus*, the results of certain experiments led me to believe that although certain *Oidia* may not be able to infect *directly* a host-plant, *a*, yet they may be able to do so by means of their power to infect another plant, *b*, from which the *Oidium* is able to infect *a*. Thus it was found that the "biologic forms" of *Oidium* on *Bromus hordeaceus*, *B. interruptus*, and *B. commutatus* are all incapable of infecting directly *B. sterilis*. They are all, however, capable of infecting *B. tectorum*. Now the *Oidium* occurring in nature on *B. tectorum* was found to be capable of infecting *B. sterilis*. If therefore it is found that the *Oidium* on *B. tectorum* produced by the sowing on this host of the conidia of *B. hordeaceus*, *B. interruptus*, or *B. commutatus* is able to infect *B. sterilis*, we shall have a clear case of a species of host-plant which serves, from the point of view of the fungus, as a bridge between other host-plants.

Whether in all cases the characteristics of "biologic forms" are identical in the conidial and ascigerous stages remains to be determined by future experiments. In the present case the "biologic form" of *E. Graminis* on *Hordeum vulgare* has been found by Marchal to be characterized in its *Oidium*-stage by its power of infecting *H. distichon*, *H. hexastichon*, *H. Zeocriton*, *H. trifurcatum*, *H. nudum*, *H. jubatum*, and *H. murinum*, but not *H. maritimum*, *H. secalinum*, nor *H. bulbosum*, nor various other grasses belonging to twenty-seven different genera. In the experiments described above with the ascospores of this "biologic form," it was found that *H. Zeocriton* and *H. trifurcatum* were able to be infected, but not *H. maritimum*, *H. secalinum*, nor *H. bulbosum*. So far, then, the characteristics shown in the ascigerous stage are the

same as those of the conidial stage. In the single experiment, however, in which ascospores were sown on *H. jubatum*—a species which Marchal states is infected by the conidia of the fungus—no infection occurred. I must state, however, that in some infection-experiments with the *Oidium* on *Hordeum vulgare*, now being carried on, I have not been able to cause infection on *H. jubatum*.

In these infection-experiments, the details of which I hope to publish shortly, some results have been obtained which seem to show that certain species of *Hordeum* exist which, while usually immune as regards the conidia of the *Oidium* on *H. vulgare*, are yet occasionally susceptible. In such cases the conidia produce, at the place of inoculation, only a few scattered conidiophores, which usually soon disappear. I have met with the same phenomenon in the case of the *Oidia* on species of *Bromus*, and have called such cases "subinfection." Such cases of "subinfection" have appeared on *H. bulbosum*, *H. maritimum*, and *H. secalinum*—species which, as a rule, the conidia of the *Oidium* on *H. vulgare* fail entirely to touch. In the case of *H. bulbosum* a little group of conidiophores—about thirty—bearing chains of spores, appeared on one leaf on the sixth day after inoculation. The fungus by the seventeenth day had died away. On *H. maritimum* only seven conidiophores appeared on a single leaf; these persisted for a few days. On *H. secalinum*, however, the infection was more pronounced, several patches of *Oidium* with almost powdery masses of spores being produced.

Now it is certainly possible that in nature—if we may assume that a number of plants of any of these three species growing near *H. vulgare* become "subinfected," and if we may assume (as on *à priori* grounds seems probable) that the conidia produced on any of these three species would be able to infect fully the same species—by means of such cases of "subinfection" as those described above an *Oidium* may occasionally extend its range of host-species.

Another fact observed is of interest in connection with the present subject. The conidia, when sown on the epidermis of a leaf, at once germinate; the germ-tube swells towards the end, applies itself closely to the cell-wall, and forms the first appressorium. Penetration of the cell-wall from this appressorium takes place, resulting in the formation, after twenty hours from sowing, of the first haustorium. In the case of conidia sown on a leaf of their own host-plant, the haustorium increases in size, and puts forth in a short time (thirty to forty hours after sowing) several long finger-like processes. When, however, the conidia are sown on a plant which the fungus is not able to infect, the conidia are still able to germinate and produce the first appressorium, and may even form occasionally the first haustorium. I have observed this, for instance, in cases where the conidia of the *Oidium* on *H. vulgare* were sown on wheat. So far as observations have gone, however, the haustoria which are produced on the "wrong" host-plant do not increase in size and as a rule do not develop the finger-like processes. In some cases what appeared to be the gradual breaking down and disintegration of the haustorium has been observed.

These facts seem to suggest that we may find in the capability or incapability of the haustorium to carry on life in the cell of the host-plant—which may mean its power to make use of the available food-stuffs in the cell and perhaps to resist certain enzymes—the essential factor which determines the life or death of the fungus on a certain host-plant. In the case of conidia sown on their own host-plant, the establishment of the first haustorium in the cell is followed by the rapid production of mycelial hyphæ, as though the fungus had received a sudden stimulus. Septate mycelial hyphæ grow out from the appressorium, and growing rapidly radiate in all directions on the surface of the epidermal cells of the host-plant, into which at short intervals they send large lobed haustoria. In a few days conidiophores are produced on these hyphæ. Similarly, but to a much less degree, the production of the haustorium by germinating conidia of the *Oidium* on *Hordeum vulgare* when sown on wheat leads to further growth. After five days from the sowing of the conidia, I have found such germinating conidia to have produced a long branched septate hypha from the appressorium. No formation, however, either of haustoria or conidiophores from these hyphæ has been observed.

We see, therefore, that it is possible for a "biologic form" to reach a certain stage of development when sown on a host-plant which apparently it is never able to really infect. Now if we suppose certain factors affecting the relations between host and parasite to be subject to variation—such as the nature or quantity of the food-stuffs in the plant-cells, or of some enzyme,—then a slight variation favourable to the fungus might be sufficient to permit of the growth being carried a little further, with the result that a few conidiophores would be produced, as in the cases which have been observed of "subinfection." On the other hand it may be that the explanation of cases of "subinfection" is to be found in the power possessed by an individual spore here and there among the spores of a given "biologic form" of being able to infect a host-plant which as a rule is immune to the attacks of the fungus in question.

A few remarks may be made on the germination of the ascospores, the period of incubation, &c.

Up to May 7, when the supply of the fungus became exhausted, the perithecia on the leaves of barley, which had been kept dry in a box throughout the winter, still contained only asci full of granular protoplasm without any trace of ascospores. These perithecia, however, after the leaves had been laid for four days on damp filter-paper, produced ripe ascospores.

If unripe ascospores—even sometimes those which are found free within the perithecium on opening it—are exposed to water, they are almost immediately destroyed, the wall of the spore splitting and breaking up, and the cell-contents being expelled into the water, with the result that no trace of the spore remains. Galloway has observed the same behaviour of the ascospores of *Uncinula necator* (Schwein.) Burr. on the perithecium opening in water.

The rapidity with which ripe ascospores germinate in water is remarkable. In one experiment a ripe but still closed perithecium, placed in a hanging drop of water, was kept under observation. After a few hours (at 12.30 p.m.) the perithecium opened by a slit, and ascospores were expelled in the surrounding drop of distilled water. At the end of one and a half hours—during which time the slide with its hanging drop had been exposed to the strong light of a south window—all these ascospores had germinated, and produced germ-tubes (often from both ends of the spores), which frequently reached to half the length of the spore.

The ascospores of the form of *E. Graminis* on *Hordeum vulgare* were found to be capable of germinating in the expressed juice of wheat obtained in the following way. 1·5 gr. weight of wheat leaves were well pounded in a mortar in 14 cc. of distilled water, so that the juice was thoroughly extracted. This juice, which gave a neutral or very faintly acid reaction on being tested with litmus paper, was filtered, and a 20 per cent. solution in distilled water made. In hanging drops of this solution four cultures were made, and in every case vigorous germination of the ascospores occurred. After twenty hours strong germ-tubes were produced from nearly all the spores: some of these germ-tubes grew, towards the apex, more or less vertically into the air. In many cases spores contained in the ascus germinated freely. After ninety-six hours the germ-tubes were long (five to eight times the length of the ascospore), and vigorous, usually simple but occasionally branched; rarely a few septa were produced.

Ascospores sown in a 2 per cent. solution of cane-sugar in distilled water germinated excellently, the germination being slightly more vigorous than in water. Sown in 1 per cent. solution of acetic acid, no germination at all resulted, this amount of acid evidently killing the ascospores, which were turned to a dark-grey or slate-colour. In ·1 per cent. solution of acetic acid only very feeble germination of a few spores resulted, the rest after twenty hours having been turned grey and apparently killed.

The best method of obtaining ripe ascospores is to suspend over the opening perithecium a hanging drop of liquid on a cover-slip supported on a wire stand. Many of the ascospores thus obtained have comparatively large clearly defined oblong or narrowly rectangular bodies among the cell-contents. Frequently—at the end of twenty to forty hours—a great number (six to twelve) of short germ-tubes will be found to have sprouted out from all parts of the ascospore; the longer ones of which grow upwards more or less vertically into the air. The tendency for the most vigorous germ-tubes of the ascospores to seek the surface of the liquid and to grow out vertically into the air is always marked, and just as is the case with conidia where the same tendency is shown, the most vigorous growth in germination is found when abundant aeration is supplied to the hanging drop. I have obtained the best results by using hanging drops on cover-slips supported on a wire stand, which is placed on wet filter-paper at the bottom of a closed Petri dish.

The incubation period in the infection-experiments described

above proved to be, as a rule, five days, more rarely four or six days. This was in a greenhouse, at a temperature of 16 to 20° C. The optimum temperature appeared to be 17 to 19° C. At a temperature below 15° C. the incubation period was perceptibly lengthened.

The following method of culture for infection-experiments has also been adopted. The leaves to be inoculated are cut off from the plant and placed on wet filter-paper at the bottom of a Petri dish, the under surface of the leaf being everywhere pressed into contact with the wet filter-paper. If the experiment is to be continued for more than a week or ten days, a seedling with the first leaf attached to the seed must be used. The Petri dishes can be placed in circular dishes of about the same depth and of half-inch greater diameter, and the intervening space at the sides stuffed with cotton-wool. This will remove all danger of infection from foreign spores, after the experiment has been set up. The results of two experiments carried out on these lines may be mentioned here. In the first, ascospores of the form of *E. Graminis* on *Hordeum vulgare* were sown on cut-off leaves of barley on May 1st. On May 6th the leaves bore, at the places of inoculation, flecks of mycelium with groups of conidiophores. In the second experiment, conidia of the same fungus were sown on April 21st, on portions of cut-off leaves of barley. On April 26th the places inoculated bore vigorous patches of mycelium with conidiophores and little powdery masses of conidia. Some of these conidia were sown in a hanging drop of water, and after twenty-four hours showed vigorous germination.

Further, if small transparent places are made in cut-off leaves by removing the epidermis on one surface and all or most of the mesophyll tissue, and conidia sown on the remaining epidermal cells, the process of germination, formation of the first appressorium and the first haustorium, and the subsequent growth of radiating mycelial hyphæ with their numerous haustoria and conidiophores can be followed under the microscope. I have obtained, in the course of five to six days, groups of conidiophores bearing ripe conidia by inoculating transparent portions of leaves prepared as described above.

I wish to thank the Director of the Royal Botanic Gardens, Kew, for giving me permission to carry out the above work in the Jodrell Laboratory. I am also indebted to the staff of the Gardens for supplying me with the necessary seedlings.

BOTANICAL EXCHANGE CLUB REPORT, 1901.

[The following notes are extracted from the Report of the Botanical Exchange Club for 1901 (issued Aug. 2, 1902), edited by the Rev. E. S. Marshall. We observe with pleasure that the Editor does not hesitate to condemn unsatisfactory specimens, and that the tendency noticeable in some quarters to regard mere forms as varieties worthy of a name meets with no encouragement.]

Silene maritima × *inflata* Hort. Shooter's Hill; orig., Woolwich Arsenal, v.-c. 16, W. Kent, 1st July and 10th October, 1901. This

plant may, after all, be only a very luxuriant form of the type. The flowers and the barren shoots at the base are entirely those of *maritima*; but the considerably branched panicle is unlike anything I have seen in that species. This is seen best in the July gathering; the October branches hardly represent the plant properly, and might well be put to *maritima* pure and simple. A strong point in favour of hybridity is that the capsules are quite barren and undeveloped, while good *maritima* growing alongside of it in the Arsenal produces seed in abundance. The plant in its natural station has now succumbed to new buildings for the production of war material, and *S. maritima*, for West Kent, has gone with it.—A. H. Wolley-Dod. "The two species are so closely allied that the occurrence of a hybrid between them is quite probable; and these specimens are just about what might be expected to result. The sterility decidedly favours this view."—Ed.

Lotus corniculatus L. Starved form. Longstone Edge, Derbyshire, 22nd July, 1898. Grows with the type for nearly a mile along the south face of a dry limestone declivity. At first sight I took it for a good variety, but now consider it rather a local form due to want of nourishment in the soil and drought. I have also seen it near Baslow, along a dry cart-track. It differs from the type in the much smaller flowers, the standard not being reflexed, and nicked rather than apiculate, pale yellow; the wings narrow oblong, the exiguous erect habit and small pale green foliage, and seeming inability to produce fruit.—W. R. Linton.

Rubus ——. "Near *Lettii*," *teste* Rogers. Bolston Wood, Herefordshire, 24th August, 1901; same plant from same locality, 23rd August, 1900. On this plant Rev. W. M. Rogers sends me the following interesting note:—"The Bolston Wood plant seems nearer to *R. Lettii* than to *R. criniger*, being on the whole perhaps nearest to *R. Gelertii*, with *R. Lettii* between it and *R. criniger*. From the very constant Irish plant of Co. Down and Armagh it differs (? constantly) by closer pubescence on stem (in that one character most like *criniger*), the clothing of the stem of *R. Lettii* consisting of longer, looser, more conspicuously white hairs, . . . by leaf more open and widespread, with felt on under-side surface whitish instead of greenish-grey, and the terminal leaflet with longer, more gradually acuminate point and narrower base, the toothing also being deeper and more finely pointed; and by the much longer ultra-axillary panicle top. These characters, though taken one by one not very distinctive, when combined give a considerably different look to the two plants; and each form seems constant to a remarkable degree." The plant is abundant over a pretty large area in Bolston Wood.—Augustin Ley.

R. melanoxylon Muell. and Wirtg. Roadside, Bexley Wood; also Crown Wood, Shooter's Hill, W. Kent, 29th July, 1901.—A. H. Wolley-Dod. "A particularly interesting discovery; it was previously known in Britain only from Scotland, Wales, and Herefordshire."—Ed.

R. præruptorum Boul. Wood borders, Upper Sapey, Herefordshire, 16th August, 1901. Named for me by Dr. Focke in 1899,

"*R. Griffithianus* Rog."; by Rev. W. M. Rogers in 1901, "*R. præruptorum* Boul." Mr. Rogers had the advantage of seeing a large series of this plant, and, judging from a comparison of Carnarvonshire specimens of *R. Griffithianus*, I believe his decision to be nearer the fact. This, if really identical with the Dorset plant named *R. præruptorum* Boul., should be an interesting additional record. It is abundant at Upper Sapey Common in woods and hedges, . , . and, as the locality is close to the borders of Worcestershire, it should be found also in that county.—Augustin Ley.

Rosa tomentosa × *canina* (agg.). Hedge, near Gallantry Bank, Cheshire, 15th August, 1901. This curious and interesting plant was not in good condition when I gathered it, having already lost many of its leaves; but some of its flowers were still open or even in bud. The universally barren fruit on so large and well-grown a bush suggested hybridity, while its slender, straightish prickles (at least on most of the branches), very compound-serrate leaves, hairy on both sides, very pubescent and glandular peduncles, pointed to *tomentosa* as one parent. For the other I can only say *canina* (sp. agg.), all the characters by which the segregates can be determined being absorbed by the *tomentosa* influence. Mr. Moyle Rogers, who has seen specimens, agrees as to the first parent, but suggests *arvensis* as the second, basing his suggestion, he tells me, on its long exserted style column, the long pedicels, peculiar prickles, and leaves. Though I cannot confidently dissent from this, I can only say that the exsertion of the styles is less prominent than in several of my authenticated gatherings of *R. tomentella*, *R. dumalis*, and other *canina* segregates, and is much less than I should have expected in a plant with *arvensis* parentage, especially in fruits so shrivelled; whereas the above-mentioned difficulty in recognizing leaf and prickle characters applies equally to *arvensis* as to *canina* segregates. The habit of the bush was not in the least trailing nor suggestive of *arvensis*. I hope to study the plant further, and to get better specimens next year.—A. H. Wolley-Dod. "I, too, fail to see any sign of *arvensis* here; this would surely have been traceable in the two buds on my specimen. From the crowded, rather short leaflets, and the small globose fruit, I incline to believe it an offspring of *tomentosa* and either *tomentella* or *obtusifolia*; the former for choice."—Ed.

R. Crépiniana Déségl. Hedge, Chelsfield, West Kent, 14th September, 1901.—J. Groves. "Specimens of this plant were originally so named by Déséglise. It grows in fair quantity, and always retains the distinctive character of the erect subpersistent sepals. Its occurrence is interesting, as the subscristate section of *R. canina* is found principally in our northern and midland counties."—H. and J. Groves. "This appeared to be identical with a rose pointed out to me at Graffham, Sussex, last summer, by Mr. Rogers, who writes: 'I agree with you. It seems just the plant that I am calling *subcanina*. In Baker's *Monograph*, *R. Crépiniana* Déségl. appears as a synonym of *R. glauca*; but this, in habit, tint, &c., looks too near *R. canina* for that.' In both the Kent and the

Sussex plants the styles are woolly, as in *glauca*, and the name *R. glauca* var. *subcanina* Christ fits them well."—Ed.

Pyrus scandica Asch. Limestone cliffs, Cefn Fedw, Denbigh, 24th June, 1901. I believe this to be identical with the plant named for me "typical *Aria suecica* Koehne" by Prof. Koehne, from limestone cliffs near Merthyr Tydfil, Breconshire. See *Journ. Bot.*, vol. xxxvii., 1897, p. 99. Notice in the plant now sent that the corymb, as the fruit grows, is not flat-topped as in *P. Aria*, but higher in the centre as in *P. Aucuparia*; also that the fruits soon become glabrous. Abundant in the Cefn Fedw cliffs.—Augustin Ley. "*P. scandica* Asch. I agree."—E. F. Linton.

Carduus arvensis (Curt.) var. *mitis* Koch (*teste* Ar. Bennett). Casual on ballast by the canal, Aintree, v.-c. 59, S. Lancashire, 28th July, 1901.—J. A. Wheldon. "This plant, with leaves quite flat, is very unlike our common Lancashire form. Mr. Williams states that *Cirsium arvense* Scop. *α normale* Williams (= var. *genuinus* Syme) corresponds with var *β mite* of Koch. I should consider the spinose undulate-leaved plant (? var. *horridum* Wimm.) to be our commonest form. I only recollect seeing this flat-leaved plant on two or three occasions, and then mostly as a casual. A few plants in the vicinity had practically entire leaves, and were probably var. *setosum* C. A. Mey. They flowered later (September is given by Babington for his *setosus*), and were cut down before they were in a condition to gather."—J. A. Wheldon. "*Cnicus arvensis* var. *mitis* Koch. So I name it."—E. F. Linton.

Hieracium Leyi F. J. Hanb. Carnedd Dafydd and Cwm Ffynnon Lloir, Carnarvonshire, July and August, 1892; Unich Water, Forfar, wild specimens, July, 1889 and 1890, cultivated, 1891; Glen Callater, S. Aberdeen, 13th August, 1884.—W. R. Linton. "*H. Leyi* F. J. Hanb., forma. Origin, Unich Water, Forfar; cult. June 20th, 1891. This plant, grown from seedlings supplied by Rev. E. S. Marshall, has proved a puzzling one; it has been placed under *H. lasiophyllum*, and again assigned (by Dahlstedt) to *H. Schmidtii* var. *superbum* Strömfelt. I am disposed to place it as a form or var. of *H. Leyi*, which, there is reason to think, is very near the above var. *superbum*."—W. R. Linton. "I gathered two allied forms in 1888 by the Unich Water and on Craig Maskeldie, close by, which remained distinct in cultivation up to my change of abode in 1900. One of these was named by Mr. Hanbury *H. lasiophyllum* var. *euryodon*, and some of Mr. Linton's specimens appear to be just what he so determined. My acquaintance with *H. Leyi* in a living state is but slight; in some respects it seems to come between *Schmidtii* and *lasiophyllum*, though nearer to the second. I do not believe that either of my gatherings can probably be placed under *Schmidtii*."—Ed.

H. britannicum F. J. Hanb. Great Orme's Head, Carnarvon, 22nd June, 1901. Exceptionally robust on the sea-cliffs. Name confirmed by Mr. Hanbury.—Augustin Ley. "This is, I think, the plant that has been colloquially known as 'cabbagy *H. cæsium*,' which was placed with doubt under that species. In has somewhat

similar foliage to *H. britannicum*, but its phyllaries are not so attenuate as in that species, nor nearly so hairy; and, whereas *H. britannicum* has very hairy phyllaries with few setæ buried among the white-tipped hairs, and also hairy peduncles with setæ, this plant has chiefly setæ on both peduncles and phyllaries, with very few sparse hairs."—E. F. Linton. "*H. casium*, as understood by Elfstrand, has root-leaves narrowed into the petiole; in the present plant they are abruptly truncate and very broad-based, recalling those of *H. stenolepis*. Would not the situation modify the clothing of the heads?"—Ed.

Statice Limonium × *rariflora*. Marshy margins of Bosham Channel, W. Sussex, 1st August, 1901.—E. F. Linton and E. S. Marshall. Same neighbourhood, 16th September, 1901.—Ar. Bennett. "Gathered in company with the Rev. E. S. Marshall, and suspected on the spot, at two localities half a mile distant, to be a hybrid between *S. Limonium* L. and *S. rariflora* Drej. After careful examination and due discussion, we were both of us convinced that sundry gatherings, with slight variations *inter se*, were this interesting hybrid. See *Journ. Bot.*, 1902, p. 41."—E. F. Linton. "As I rather thought, this is substantially *S. bahusiensis* var. *danica* Fr., according to specimens gathered by Gelert and Möller (their plant, however, is much smaller); but, in *Sum. Veg. Scand.* p. 200, Fries says, '*Danica* = *S. rariflora* Drej.,' which is exactly what we should not say. You see that there is need for this to be carefully compared at Kew and B. Mus. before you make any note on it. I doubted the hybridity, and do now, but cannot contradict it; still, it needs careful comparison."—Ar. Bennett. "It is only fair to state that Mr. Bennett's gathering was from a point south of Bosham village (and, I believe, from one plant or group of plants); the original stations, to the north, being submerged when we arrived there. No one would place my extreme specimens of the alleged hybrid under any one type. I have practically no doubt that they are all either primary or secondary hybrids between two very distinct species; being only present where these grow together, and forming nearly a complete series between them. The same phenomena are likely to occur in Sweden. Unfortunately, I have hitherto been unable to consult the national herbaria as recommended."—Ed.

Rhinanthus minor Ehrh., *Beitr.* vi. 144, sens. restr. (*Alectorolophus minor* Wimm.; Dumort., *Fl. Belg.* p. 33). In grassy meadows by Llyn Padarn, Llanberis, Carnarvonshire, June, 1900. I send these specimens, which have been passed as true *R. minor* by Dr. J. von Sterneck, who has made a close study of the various forms of the corn rattle. He has described several new species; but he puts them under the name *Alectorolophus*, a genus which Haller described in the *Enumeratio Stirp. Helv.* ii. 623 (1742), and which was also adopted by Moench in the *Methodus* of 1794. *R. minor* is our common British plant, and at Llanberis I collected it from the lake margin to about 1000 feet above sea-level; but I did not then see it above 2000 feet. The plant which I described as *R. Crista-galli* var. *angustifolius* Gren. and Godr. in my *Berkshire Flora*, is to

a great extent, if not entirely, the plant which Schur, in the *Enum. Plant. Transs.* 512, called *R. stenophyllus*; and this has a wide range in Great Britain, from West Ross south to Berkshire, and in Ireland from Westmeath, whence the Rev. W. R. Linton and Mr. H. C. Levinge distributed it as var. *fallax*, to Co. Cork, where I gathered it in 1890. This is the plant which was distributed by Mr. F. J. Hanbury from Tain, East Ross, in 1890, under the name *R. major*, but he was afterwards inclined to refer it to a variety of *R. Crista-galli*. I have not seen Grenier and Godron's type of *angustifolius*, but it is not unlikely that it is synonymous with *R. stenophyllus*. See *Ann. Scot. Nat. Hist.*, 1901, 177.—G. Claridge Druce. "Dr. von Sterneck's determination on the label is '*Alectorolophus minor* (Ehrh.) Wimm.' In his *Monograph* (p. 12) he gives 1747 as the date of Haller's name; this, however, would be antedated by *Fistularia* L. (1735) if the year 1753 were not adopted as a starting-point. Allioni was the first to revive *Alectorolophus* (1785); which is adopted by Sterneck in preference to *Rhinanthus* L. (1753), on the ground that the latter is an *aggregate* genus; here, I feel sure, our British authorities will not follow him."—Ed.

Rhinanthus Crista-galli L. var. *stenophyllus* Schur? Downs above Sutton, v.-c. 13, W. Sussex, 3rd August, 1901.—E. F. Linton. Also sent, without a name, from the same station, by E. S. Marshall. (No. 2584.) "Determined by Dr. von Sterneck as '*Al. stenophyllus* (Schur) Sterneck.' This is the plant referred to above by Mr. Druce; Schur, however, described it as *R. minor* var. *stenophyllus* (1866), not as a species. Older varietal names are *R. minor* γ *angustifolius* Koch (1844) and β *angustifolius* Gren. and Godr. (1850); but these will fall, as there is a species named *R. angustifolius* by Gmelin in 1806. The plant so abundant on heaths near Tain, now placed here by Sterneck, was thought by Mr. Hanbury and myself to be a distinct species when we found it in 1890; Prof. Haussknecht wrongly determined it as *R. major*, and Prof. Lange afterwards named it *R. minor* Ehrh. var. *angustifolius* Koch, which turns out to be correct."—Ed.

Ballota ruderalis Sw. In two places at Studland Bay, Dorset, June, 1901. Having gathered *B. ruderalis* for the first time at Studland, I am satisfied as to its specific distinctness from *B. alba* (L.), auct. plur. The soft, velvety appearance of the whole plant, and pleasant odour when bruised, contrast sharply with the common black horehound. Nyman, *Consp. Fl. Eur.* p. 581, admits the two species—*B. alba* (L.), with synonym *fœtida* Lam., the common species; and *B. nigra* L., with synonym *ruderalis* Sw., the species with more restricted distribution. Babington (*Man.* ed. 8, p. 284) distinguishes the two species, while Hooker (*Student's Flora*, p. 330) unites them. Of course, Bentham does likewise.—J. Cosmo Melvill.

Salicornia lignosa Woods. Gravelly shores near Bosham, West Sussex, in plenty, September 16th, 1901.—Ar. Bennett and E. S. Marshall. Mr. Bennett's valuable remarks are appended: "*Salicornia radicans* Smith in *Engl. Bot.* t. 1691 (1807). *S. fruticosa* Sm. *Engl. Bot.* 2467, non L. *Sarcathria radicans* Rafin. *Fl. Tellur.* iii. p. 47 (1836)—this I have not seen. *S. fruticosa* L. β *radicans* Gren.

and Godr. *Fl. France*, iii. p. 28 (1855). ? *S. sarmentosa* Duv. Jouve, *Bull. Soc. Fr.* tome 15, 174 (1868), according to Lloyd, *Flore de l'Ouest de la France*, ed. 4, 292 (1886); but I am inclined to think, from the name, it may really be Woods' *lignosa*, but I have seen no specimens. Hooker and Arnott, *Brit. Fl.* ed. 8, 366 (1860), remark 'Although we see no reason to admit more than two British species, even these two Mr. Bentham combines.' It is true Mr. Bentham does so, but he did not understand *radicans*, or had not seen it growing; if he had, he certainly would not have done so, the whole habit, growth, and aspect of the two plants are so totally different in *radicans* and *herbacea*. A. G. More, in *Supp. Fl. Vect.* (*Journ. Bot.* 170, 1871), observes that he considers the *S. lignosa* of Woods to equal *S. fruticosa* L., and says: 'I think we may safely claim *S. fruticosa* L. as an Isle of Wight plant.' In this I cannot concur, as the seeds of the Bosham specimens are not tubercled! as those of the plant of Linnæus are. Mr. More suggests that the soft mud in which he finds the true *radicans* of Smith allows it to creep and root; but this is not my experience on the Sussex coast near Shoreham. I have there found *radicans* on hard mud—so hard that it was very difficult to get characteristic specimens. Though *lignosa* does not as a rule root, yet I found on one Bosham specimen roots about three inches away from the centre. Our *radicans* does not seem (or did not) to be well known on the Continent. There seems to be in Scandinavia a biennial var. of *herbacea* = *S. biennis* Afz., and a semi-perennial form = *S. perennans* Willd. *Sp. Plant.* i. 24 (1797; I wonder what this is?). Koch, *Syn. Fl. Germ. et Helv.* ed. 2, ii. 693 (1844), says: '*S. herbacea* β *pachystachya*, spicis duplo crassioribus: *S. radicans* Sm. *Engl. Bot.* no. 1691, saltem ex specimine a Woodsio ad Sonderum missa. Hanc ad mare balticum legit Detharding.' Now Detharding, in his *Consp. Fl. Megal.* p. 4 (1828), remarks: 'A notable form occurs on the island of Poehl! The stems are robust and perennial?—*lignosus*'; and quotes 'Roemer and Sch. *Syst.* i. 39 and 40, *Sal. prostrata* et *S. perennans*.' I doubt Koch's opinion; the mere fact of thick spikes does not make *radicans*. Nolte, *Nov. Fl. Holst.* i. (1826), may have meant the true plant as *radicans*, as he says, 'vere perennis,' etc. The true plant seems to be found in France. Lange says, 'N. Spain.' *S. fruticosa* δ *radicans* Willk. and Lange, *Prodr. Fl. Hisp.* vol. i. 308: 'Ad littora oceani pr. Cobus Galliciæ, Lange.' And Richter accepts 'Angl. Gall. Hisp.' I much doubt the Denmark record. I now believe that we must consider Woods' plant as a subspecies. *S. lignosa* Woods, in *Proceed. Linn. Soc.* ii. 109–113 (Ap. 15, 1851), =*S. radicans* Sm. β *lignosa* Townsend, in *Fl. Hants*, 287 (1883). What we have to do is to find out how Woods' forms are represented on the Continent; surely we are better able to do this than the Germans." Mr. Bennett's specimen noticed above is the only rooting one that I have seen out of a large number examined. At Thorney, near Emsworth, where *S. lignosa* abounds on the shingly west and south shores, I found several plants growing in soft mud, but displaying no tendency to root—just the converse of his experience at Shoreham with *S. radicans*."—Ed.

Euphorbia exigua L. var. A compact form, growing in limestone crevices—not in arable land—between Rhôs-on-Sea and the Little Orme's Head, borders of Denbigh and Carnarvon, September, 1901. I send this compact, stout form to show its condition when growing in limestone crevices near the shore.—J. Cosmo Melvill. "I do not see anything off type in this. It occurs on the oolite of the Isle of Purbeck, in an extremely stunted form, yet without any characters to make a variety."—E. F. Linton. "I agree; the real interest of this gathering consists in its proving that the species is a true native of Britain."—Ed.

E. exigua var. *retusa* (DC.). Yeldersley, S. Derbyshire, 2nd August, 1901. This was fairly abundant in crops, and the prevalent form, none of the type being seen."—W. R. Linton. "Very well marked."—Ed.

Juncus obtusiflorus Ehrh. var. *confertus* Döll. *Rhen. Fl.* 180 (1843). St. Ouen's Pond, Jersey, July 25th, 1900. Plentiful on the south side of the pond, with the type. I owe the name and reference to Mr. Arthur Bennett, who remarks: "I have not seen this form for England before. None of my specimens are anything like this."—L. V. Lester. "Apparently a good variety."—Ed.

Cyperus fuscus L. Ditches in the Walton Valley, North Somerset, 12th September, 1901.—J. W. White and R. P. Murray. "It is certainly native in Somerset. A man who was cleaning out the ditches said he had known it there for forty years."—R. P. Murray.

Bromus interruptus Druce in *Pharm. Journ. Suppl.* (October 5th, 1895), *Journ. Bot.* (December, 1895), and in *Linn. Soc. Journ.* (1896), pp. 426-430. In a field of vetches in the parish of Brightwell Salome, Oxon, June, 1901. Exception has been taken to the citation of the species from *Pharm. Journ. Suppl.*, because the species is not diagnosed there; but the plant itself had been previously diagnosed by Prof. Hackel *in litt.*, and published by me in *B. E. C. Report* (1888), p. 240, as a variety of *Bromus mollis* under the name *interruptus*. Subsequent study, however, revealed that it possessed claims for specific distinction, and I accordingly named it as a species in the above periodical; and this has priority over either the *Journal of Botany*, where a brief diagnosis was given, or the *Journal of the Linnean Society*, where a full account and description are published.—G. Claridge Druce. "The two specimens in my parcel striking me as rather poor examples led to my examining them, and finding all the flowers opened on one plant with the palea entire, and all I opened on the other with the palea split to the base. It then became evident that the specimen with the entire palea had all the appearance of being *B. mollis* L., and not *B. interruptus* Druce; it is, in fact, *B. mollis* var. *glabratus* Doell. The full account of *B. interruptus* occurs in *B. E. C. Report*, 1895, pp. 503–4, where Mr. Druce raises it to a species. Mr. W. H. Beeby questions whether it is not a monstrosity rather than a species; Prof. Hackel hesitates between a species and an anomalous form, believing the split palea to have originated from some abnormal state; and the editors of the *Report* (Messrs. Groves) report that 'Dr. Stapf and Mr. Rendle

considered this (plant) a monstrosity rather than a species.' It would be interesting to learn what is Prof. Hackel's matured opinion. From the time when I first found it, near Thetford, Norfolk, June, 1882, and tried through Mr. Arthur Bennett to get a name, but in vain, and so let it be, I have always regarded it as a *B. mollis* variety, and do not see reason to alter this view."—E. F. Linton.

"I also think this too closely allied to *B. mollis*. The *Pharmaceutical Journal* is not a strictly botanical publication; new species would be more fitly proposed in some more representative organ."—Ed.

[Mr. Marshall's note is much to the point in the present instance, although we do not understand him to suggest that species published elsewhere than in "strictly botanical publications" are not entitled to recognition. But the Supplement to the *Pharmaceutical Journal* in which Mr. Druce's brief note on *Bromus interruptus* appears is no part of the magazine, and is not always bound up with it. It contains market reports and odds and ends, is separately paged in roman numerals, and its contents do not even appear in the index to the volume, which will thus be searched in vain for any reference to Mr. Druce's note. Under such circumstances it seems idle to contend that priority of name-publication can be claimed for the note. Nor is it easy to see what is to be gained by such a claim; the note in question appeared in October, and the name was published in this Journal on December 1st. It may be worth while to reprint the note here; the description appeared, not in this Journal, but in *Journ. Linn. Soc.* (Bot.) xxxii. 426–8 (1896), and no figure, so far as we know, has appeared:—

"New Species of *Bromus*. — Mr. G. Claridge Druce, of Oxford, writes as follows:—'In 1888 I found in Berkshire and Oxfordshire a curious form of *Bromus*, which was named *B. mollis* var. *interruptus*. From subsequent study I have been led to consider it a distinct species. It will be figured and described in an early number of the *Journal of Botany* under the name of *Bromus interruptus*.'" — Ed. Journ. Bot.]

Equisetum sylvaticum L. var. *capillare* (Hoffm.). Harthill, Cheshire, 15th August, 1901. This is the only form of *E. sylvaticum* I have seen in Cheshire; in the Broxton Hundred of which, at any rate, it is a rare species.—A. H. Wolley-Dod. "The form we call *E. capillare* Hoffm.; but a doubtful variety, probably the product of soil and situation."—E. F. Linton. "Hoffmann, *Deutschlands Flora*, pars ii. p. 3 (1795), adds under *E. sylvaticum*: '(Equis. *capillare*, frondibus tenuissimus compositis sterilibus),' apparently meaning to express doubt of their specific distinctness. It seems to me a well-marked plant, as good as varieties usually are in the genus—which, perhaps, is not saying very much. In Scotland I have frequently seen typical *sylvaticum* growing in situations similar to those which produce *capillare*."—Ed.

SHORT NOTES.

Veronica triphyllos in Surrey.—This plant was found on May 2nd in an uncultivated field at Frensham, which till this year has had crops in succession, generally root, or pea, or cabbage. The other plants in the field are *Lamium amplexicaule*, *L. purpureum*, and other very common weeds.—L. F. Marindin.

Through the kindness of Mrs. Marindin, I was able to see *Veronica triphyllos* growing in some abundance near Frensham, as described above. It is considered native in the counties of Suffolk, E. & W.; Norfolk, E. & W.; York, S.W. & mid. W. Mr. Bennett informs me that in these counties it grows in cultivated fields, as well as on the bordering heaths, and (in Yorkshire) in sandy lanes bordering the arable land. In the former situations it would grow with *Cerastia*, &c. The light sandy soil of Frensham and adjoining district might well produce the same plants as Norfolk and Suffolk, and a careful search should be made in that neighbourhood to ascertain if *V. triphyllos* can be discovered under less suspicious circumstances; if the plant does not die out, but can battle with success amongst such "natives" as those growing with it, that fact would certainly cause one to regard it as something more than a mere casual, such as *Saponaria Vaccaria*, *Bunias*, *Camelina*, &c. Both *V. triphyllos* and *V. verna* flower very early, before many botanists are astir, and it may be that both these species are yet to be found in untouched as well as in cultivated sandy situations in this and other parts of England, as they are widespread continental species in similar habitats.—C. E. Salmon.

Mrs. Tindall announces the finding of *Anthoceros dichotomus* Raddi in South Devon—a new record for the British Isles. The specimens were determined by Stephani. Mr. Macvicar had found among Croall's plants an *Anthoceros*, unrecognizable in the dried state. Fresh specimens were sought for, at his request, and found in the fertile state by Mr. Cuthbert Blakiston.

BOOK-NOTES, NEWS, &c.

At the meeting of the Linnean Society on April 16th the first paper was by Dr. H. Charlton Bastian, entitled "On some points in connection with the ordinary development of *Vaucheria* resting-spores." Alluding to Pringsheim's account of the germination of the spore of *Vaucheria*, Dr. Bastian narrated that in 1891 he had some of them under observation in a bottle loosely covered with a screw-cap, and after a few weeks these spores were found to be germinating and emitting filaments. Repeating his experiments in 1902 on *Vaucheria racemosa*, some material was kept in a shallow dish, and a few days later the spores were transferred to a stoppered bottle; another portion was put into a tumbler, loosely covered to exclude dust. Within seven weeks the bottled specimens were noticed to be germinating, a process which did not take place in

those in the tumbler for some time later; altogether the process was observed in hundreds of spores. The peculiar phenomenon to which the author drew special attention was the pigment-granules, sometimes only one, frequently more in number, which may be regarded as refuse-products left over during the process of molecular transformation that the spore has undergone in becoming decolorized; they are heaps of fine granules, without any bounding membrane. These pigment-heaps were found to pass into the filament as spheres with a sharply-defined outline, or else pressed together in more or less compressed form. Very slight movements were detected in them—usually a to-and-fro movement. One pigment sphere was seen to be encysted, outside the filament from which it had been liberated. These forms resemble *Amœbæ* or the simplest form of *Actinophrys*, but seem to be so heavily charged with indigestible matter as to have but a slender chance of further development. Subsequent observations since the paper was drawn up, on some of the last batch of developed resting-spores, after an interval of ten months, showed that the marginal protoplasm had increased in amount, and that in many cases this protoplasm was segmenting into small monads which were liberated by the rupture of the bounding membrane. This kind of change was familiar to the author as occurring in the resting-stage of *Amœbæ*.

A CORRESPONDENT asks about a "distinct species" of *Fritillaria* announced as a British plant by the *Globe* of April 23 in the following passage:—"Among the purple snake's-heads, with their characteristic spots on the petals, will usually be found, but only here and there, pure white specimens, and these are not, as might be supposed, a mere variety, such as may be found in a bed of wild hyacinths, where occasional white blossoms are dotted about among the blue ones. They belong to a distinct species, with a botanical name of its own. The more common kind is called *Fritillaria meleagris* . . . . while the rarer is known as *Fritillaria præcox*. It appears to be an invariable feature of a natural fritillary bed that the white flowers are represented, though only in an almost infinitesimal proportion." The name *F. præcox* appears in Sweet's *Hortus Britannicus*, p. 426 (1827), but it is needless to say that the plant is a mere albino of *F. Meleagris*.

DR. OTTO KUNTZE has sent for our inspection proofs of the Introductory Chapter of the "Lexicon Generum Phanerogamarum inde ab anno MDCCXXXVII cum nomenclatura legitima internationali et systemate inter recentia medio," by Mr. Tom von Post, of Upsala, the work being revised and enlarged by himself. The Introduction contains a preface in German, French, and English, in which the objects of the work are stated. These are (1) to determine the correct names of genera; (2) to reform, according to the international code and its continuation the *Codex brevis maturus*, the nomenclature of subgenera, families, and higher groups; (3) to correct the spelling of names. The first part will form an alphabetical list of all valid names of genera and sections, as well as synonyms. The second part is a systematic and numbered list

of all valid genera, the arrangement being based on Engler's system. Under every genus will be indicated the number of species, their geographical distribution, and the subgenera and sections. The nomenclature of fossil genera is to be corrected, and in an appendix will be found a list of cryptogamic generic names which must be changed according to laws of priority. Following the Preface comes the "Codex brevis maturus," set out in the three languages. We may note the following points:—Names of groups above genera start from 1763, with Adanson's *Familles des Plantes*: genera and their sections with Linnæus's *Genera Plantarum*, 1737; and species and their forms with the *Species Plantarum*, 1753. Group-names are to be latinized according to certain rules which indicate the suffix for each kind of group. Publications can be considered as bearing on priority only as far as they are printed in Latin characters, in the Latin, English, French, German, or Italian languages; but this rule is not retrospective as to Gothic characters, the prohibition of which is to begin with a date to be fixed by a competent Congress. Each binominal is followed by the name of the author who first published it as it stands. Legal publication is implied up to the present in the sale or distribution among the leading public herbaria of numbered specimens, accompanied by printed or autograph tickets bearing date of sale or distribution, but this rule may be invalidated by a competent Congress. Rules are also laid down for the formation and spelling of generic and specific names, and we are glad to note that the Neo-American trinominal is inadmissible.

We are glad to see that our contributor, Mr. William Philip Hiern, has been elected a Fellow of the Royal Society. It is thirty years since Mr. Hiern published his monograph of *Ebenaceæ*, since which time he has been and still is engaged in systematic work; he has just completed the *Scrophulariaceæ* for the *Flora Capensis*.

The "Ruskin Plot" is not the name of a conspiracy, but of a piece of land between Cothill and Besselsleigh, Berkshire, about five miles from Oxford, which has been presented by Mr. Henry Willett to the Ashmolean Natural History Society of Oxfordshire, who will maintain it in its natural condition. An account of the plot, which is nearly two acres in extent, is given in the recent Report of the Society by Mr. G. C. Druce, who was instrumental in securing the gift. The "plot" appropriately commemorates John Ruskin, whose name is intimately associated with Oxford.

The *Alpine Flora for Tourists and Amateur Botanists* (Longmans, 7s. 6d.), which Mrs. Gepp has translated from the German of Dr. Julius Hoffmann, is well calculated to be of service to those for whom it is intended. The forty plates contain 250 figures, the colouring of which, if not all that could be desired, is less unsatisfactory than in most works of the kind; the descriptive portion is confined to the species figured, and will, we think, be disregarded by the average tourist, who will content himself with matching his finds with their pictured representations. Within its limits, this is a distinctly useful book, of a convenient size for carrying about—

an advantage gained at the expense of the plates, which are somewhat unduly cut down.

THE *Flora of Thanet*—"a catalogue of the plants indigenous to the island with a few rare aliens, by G. M. Pittock, F.R.M.S., M.B. Lond. and friends" (Margate: Robinson & Co.)—is a curious little production. It "embodies" the observations of the late Mr. Dowker and of three local folk, without whose co-operation the writer "would never have ventured on the book, owing to the very limited time [he] could spare from professional pursuits;" Mr. Flower's *Flora Thanetensis* "furnished the groundwork"; and from four botanists (including Mr. Dunn and Mr. Nicholson, neither of whom is now "of the Royal Botanic Gardens, Kew") the author acknowledges "kind assistance." The outcome is a mere list of 565 plants (without localities) in double columns, occupying ten pages! There is no attempt at segregation—*Rubus fruticosus* and *R. cæsius* are the only Rubi. *Parturiunt montes: nascetur ridiculus mus.*

MR. TOWNSEND is preparing a new edition of his *Flora of Hampshire*, in which he will have the help of the Rev. E. S. Marshall.

A LONG and interesting correspondence has appeared in the *Times* on Lord Kelvin's recent address on the relation of science to religion, in which the Director of Kew Gardens has taken part. The *Times*, in a leading article on May 13, criticizes his letters somewhat severely: "It might have been expected that, by men of science at all events, [the subject] would have been discussed without heat, and above all without personal comparisons; and the letters addressed to us on the subject by Sir William Thiselton Dyer are in this respect unworthy of the high scientific position of the Director of Kew Gardens."

THE *Journal of the Royal Horticultural Society* has become so important and useful a periodical, not only to horticulturists but to botanists, that its disfigurement by inappropriate and meaningless illustrations (which do not illustrate) is to be regretted. The Society is apparently in the possession of a number of blocks, and whenever part of a page is vacant, one of suitable size is stuck in. It is bad enough when these are labelled, but worse when they are not: many subscribers will, we think, be puzzled at the portions of a series (1–4, 11, 14–16) of figures (of *Nepenthes*) which come at the end of "Meteorological Observations at Chiswick in 1902" (p. 1081): even funnier are the details of inflorescence figured under "pests of garden vegetables" on p. 831.

UNDER the title "Die Periodicität morphologischer Erscheinungen bei den Pflanzen" Mr. Tine Tammes has published the results of his observations mainly on the relation which the presence or absence of the leaf or leaflet, or other characters of these organs, bears respectively to the growth in length of the internodes or of the intervening portions of the leaf-rachis of a compound leaf. The paper appears as Deel ix. No. 5 (1903) of the Verhandel. d. Koninkl. Akad. van Wetensch. Amsterdam (Section 2).

S Moore anal
S C Hendrey del et lith.

West Newman imp.

Petalostigma Banksii *Britten & S. Moore.*

PETALOSTIGMA BANKSII, sp. n.

By James Britten, F.L.S., and Spencer Moore, F.L.S.

(Plate 453.)

In preparing for publication the account of the plants collected by Banks and Solander during Cook's First Voyage, the concluding part of which will be issued during the current year, it became evident that a figure referred provisionally to *Petalostigma quadriloculare* F. Muell. differed from that species in certain important particulars. Banks and Solander's plant was not found in the herbarium, but subsequent search led to its detection, bearing the MS. name which it bore on the plate and by which it had been described in MS. The specimen, not a very good one, like the drawing, only represented the fruiting stage; but further investigation led to its identification with flowering examples collected by Robert Brown in 1802. The engraving from Parkinson's figure will be reproduced in the Botany of Cook's Voyage; but the plant seems of sufficient interest to justify the publication of a plate showing the flowering state of the plant, which appears to be new. The original description will accompany the engraving; the following has been drawn up from the specimens, one or two details being added from Brown's MS. description.

Petalostigma Banksii Britten & S. Moore, sp. nov. — Fruticosum, dioicum, ramis abundanter foliosis cinereis crebro lenticelliferis, foliis petiolatis ovato-oblongis vel oblongo-obovatis apice sæpissime retusis juvenilibus appresse sericeis cito glabris vel summum puberulis tenuiter coriaceis supra in sicco olivaceis subtus aliquantulum pallidioribus, florum masc. perianthii segmentis obovatis vel obovato-oblongis obtusissimis extus dense fulvo-sericeis, columna staminea attenuata superne pilosa ceteroquin glabra, staminibus circa 20, antheris late oblongis apice sparsissime pilosis vel obscure 2-denticulatis, florum fem. perianthii extus fulvo-sericei segmentis 4 (ex schedis beat. R. Brown 4–6) exterioribus ovato-oblongis interioribus rotundatis illis obtusis his obtusissimis, ovario anguste ovoideo dense fulvo-sericeo 3–4 loculo, styli ramis 4 ("rarius 3" R. Br.) linearibus aliquatenus torquatis marginibus undulatis, capsula (ad normam generis) drupacea subglobosa lutea glabra 8-sulcata 8- (vel 6) -valvi, seminibus (teste R. Br.) oblongis compressis glabris luteo-fuscis (in sicco fusco-purpureis).

Hab. Endeavour River; *Banks & Solander*. Islands of Gulf of Carpentaria, Nov. 17–28, 1802; *R. Brown* (Nos. 3573, 3574).

Frutex ramosissimus (teste R. Br.). Foliorum lamina 1·7–2·5 cm. long., 0·9–1·3 cm. lat.; costa media utrinque conspicua, costis secundariis 3–5-jugis ascendentibus sæpe fere evanidis; petioli circa 0·4 cm. long., puberuli. Florum masc. ante anthesin modo 0·2 cm. diam., pedicelli 0·1–0·2 cm. long., fulvo-sericei; perianthii segmenta 0·23 cm. long.; columna staminea paullulum ultra 0·1 cm. alt., circa 0·3 cm. diam.; antheræ 0·1–0·13. cm. long., filamenta fere duplo excedentes. Florum fem. pedicelli crassius-

culi, 0·12 cm. long.; perianthii segmenta 0·25 cm. long. Ovarium 0·13 cm. long., vix totidem diam., 4-sulcatum; styli rami basin versus leviter angustati, ægre 0·5 cm. long., dorso puberuli. Capsula (fide R. Br.) magnitudine cerasi maximi, cortice carnosa, lutea, amarissima, sesquilineam circiter crassa; valvarum pars carnosa (intus mensurata) 0·3 cm. lat., pars crustacea lat. ei propemodum æqualis. Semina basi parum obliqua, 0·5 cm. long.; carunculus inconspicuus.

The following are the chief differences between the two species of *Petalostigma* now known :—

P. QUADRILOCULARE.	P. BANKSII.
A tree.	A shrub.
Leaves ovate-acute, shining above, tomentose to almost glabrous below (elliptic lanceolate in var. *glabrescens*).	Leaves ovate-oblong or oblong-obovate, usually retuse, very soon puberulous or quite glabrous, not shining above.
Male flowers. — Buds 0·35 cm. diam.; perianth segments orbicular or broadly obovate; axis of staminal column stout and villous; tip of anthers villous.	Male flowers.–Buds 0·2 cm. diam.; perianth segments obovate or oblong-obovate; axis of staminal column slender, glabrous below, pilose in the upper part; tip of anthers with 2–5 hairs or very shortly denticulate.
Female flowers.–Perianth 0.5 cm. long, the segments acute; ovary globular; stigmas expanded.	Female flowers.—Perianth 0·25 cm. long., with obtuse segments; ovary narrowly ovoid; stigmas linear.
Fruit.—Outer valves 0·4–0.5 cm. across; seeds 0·6 cm. long.	Fruit. — Outer valves 0·3 cm. across; seeds 0·5 cm. long.

There has been some controversy as to sex distribution in the case of *P. quadriloculare*, and in view of this it is not without interest to find R. Brown noting of the species just described, "Masculi flores in diverso frutice." We are unable, we may add, to confirm the truth of Baillon's assertion (Adansonia, vii. p. 353) that the flowers of the first-named are sometimes monœcious, all the specimens seen by us having borne either male or female flowers, never the two kinds together.

The MS. name (*Xylococcus sericeus*) given by Brown to *P. quadriloculare* has hitherto been misprinted. Bentham (Fl. Austral. vi. 92) quotes it from Bauer's very beautiful drawing of *Hylococcus*, and the *Index Kewensis* follows him; neither seeming to have known that it had previously appeared in print in Mitchell's *Journal* (1848), where we read (p. 389): "Again we saw in the woods about this camp [on the left bank of the Mooni] the *Hylococcus sericeus* R. Br., a remarkable tree, with oblong leaves, and fruit resembling a small orange. It is a curious genus, and belongs to the poisonous order of Spongeworts" (p. 389); the name also appears in the list of plants collected (p. 433) and is not indicated as new, and would thus seem to have been known to one of the botanists—Lindley, Bentham, W. J. Hooker, and De Vrize—who

"supplied the botanical matter and notes contained in the volume" (p. vi.), but we are not aware that it had been previously published. The brief description is hardly sufficient to justify the substitution of *Hylococcus* (1848) (or *Xylococcus*, if the earliest spelling were adopted), for *Petalostigma* (1857).

EXPLANATION OF PLATE 453.

Petalostigma Banksii.—1. Branch of the male plant. 2. Flower from same, showing the slender column, from which some of the stamens have been removed. 3–4. Anthers. 5. Branch of a female plant. 6. Flower from same. 7. Ovary with bases of style-arms. 8. The plant in fruit, from Parkinson's drawing. (Figs. 1, 5, 8 nat. size, the rest magnified.)

WEST SUSSEX PLANT-NOTES FOR 1902.

BY REV. E. S. MARSHALL, M.A., F.L.S.

FOR various reasons I was unable to make many excursions in the county during last summer; but it may be worth while to place on record the comparatively meagre results obtained. New records for v.-c. 13 are starred. I had the advantage of short visits from Rev. W. Moyle Rogers, Major Wolley-Dod, Messrs. C. E. Salmon, R. W. Scully, and W. A. Shoolbred, Localities with no number are in Dr. Arnold's district I. (W. Rother).

Thalictrum flavum L. II. Amberley. The Fittleworth locality is really in district I.—*Ranunculus Baudotii* Godr. West Wittering. —*R. sardous* Crantz. West Wittering.

Papaver dubium L. II. Wiggonholt.—*P. Lecoqii* Lamotte was a plentiful garden weed at the Rectory, Graffham, in 1901 and 1902.—*P. Argemone* L. I. Selham. II. Wiggonholt.—*Glaucium flavum* Crantz. West Wittering.

Nasturtium sylvestre R. Br. II. Amberley.—*N. amphibium* R. Br. Marshes near Fittleworth Station.—*Arabis hirsuta* Scop. I. Slindon; Houghton; Graffham; Cocking. II. Rackham; Amberley. —*Cardamine flexuosa* With. I. Midhurst; Selham; Fittleworth. II. Parham. —*Erophila virescens* Jord. Selham.—*E. stenocarpa* Jord. II. Wiggonholt.—*E. præcox* DC. I. Sandy ground, N. of Chichester, and on an old wall in the outskirts of the city; between Upwaltham and Eartham; Houghton; Bignor; West Stoke. II. Rackham; Amberley. Evidently frequent on the chalk, but soon disappearing. — *Teesdalia nudicaulis* R. Br. II. Hurston Warren; Wiggonholt Common.—*Cakile maritima* Scop. West Wittering.— *Raphanus maritimus* Sm. West Wittering; plentiful at one spot.

Viola silvestris Reichb. Common about Arundel.—*V. Riviniana* Reichb. var. *nemorosa* Neum. W. & M. Combe Wood, near Houghton; wooded downs above Bignor. Flowers large; spur coloured, hardly furrowed.

Polygala oxyptera Reichb. Houghton.

Frankenia lævis L. West Wittering.

Cerastium quaternellum Fenzl. I. Lodsworth Common; West

Wittering. II. Hurston Warren; Wiggonholt Common. — *C. tetrandrum* Curt. West Wittering; Pagham. — *C. pumilum* Curt. Downs near West Stoke.—*C. semidecandrum* L. I. Coates Common; foot of Bow Hill, towards Chilgrove. II. Wiggonholt.—*C. arvense* L.* Between Chilgrove and West Dean; very fine plants, of which Mr. Arthur Bennett wrote:—"I am unable to distinguish this from var. *maximum* Hollick & Britton in *Bull. Torrey Bot. Club* (t. 64, fig. 2), p. 47, vol. xiv. (1887); but I have not seen a specimen." The variety is found in California. — *Stellaria umbrosa* Opiz var. *decipiens* E. S. Marshall. II. Lane near Wiggonholt. — *Arenaria peploides* L. Pagham; West Wittering. — *Sagina apetala* L. var. *prostrata* Bab. II. Pulborough.—*S. ciliata* Fr. I. West Wittering. II. Wiggonholt.—*Lepigonum salinum* Kindb. var. *neglectum* (Kindb.). West Wittering.

Claytonia perfoliata Donn. Well established on a roadside bank near the cricket ground, Midhurst.—*Montia fontana* L. Burton Park.

Rhamnus catharticus L. Graffham Down.

Trigonella purpurascens Lam. West Wittering. — *Trifolium arvense* L. Lavington; Selham; West Wittering.—*T. striatum* L. Selham; West Wittering.—*T. scabrum* L. Pagham; West Wittering; sandy railway-cutting, Selham. — *T. glomeratum* L. West Wittering; very local, associated with *T. suffocatum* L.—*T. filiforme* L. Pagham; West Wittering; Coates Common.—*Lotus corniculatus* L. var. *villosus* Ser. The Spit, West Wittering. I also found it near Clymping in 1892. — *Astragalus glycyphyllos* L. Bushy ground below Bury Hill (east side).—*Ornithopus perpusillus* L. I. Coates Common; Selham; West Wittering. II. Wiggonholt.—*Hippocrepis comosa* L. Downs near Cocking; scarce.

Prunus Avium L. I. West Stoke. II. Parham.—*P. Cerasus* L. Slindon; Bignor; West Stoke.—*Rubus Idæus* L var. *asperrimus* Lees. Railway-bank, Selham.—*R. nitidus* Wh. & N. Selham.—*R. holerythros* Focke. Burton.—*R. incurvatus* Bab. ("the Wye Valley form"), Midhurst Common, *Rogers & Salmon*. — *R. rhamnifolius* Wh. & N. Lodsworth Common; West Wittering. — **R. Bakeri* F. A. Lees. Lodsworth Common; a white-flowered form, approaching *rhamnifolius*.—*R. dumnoniensis* Bab. Midhurst Common, *Rogers & Salmon*. —*R. rhombifolius* Weihe. Lodsworth Common.—*R. argentatus* P. J. Muell. Lodsworth Common. — *R. pubescens* Weihe var. *subinermis* Rogers. Lodsworth Common. — *R. macrophyllus* Wh. & N. var. **macrophylloides* (Genev.). Midhurst Common, *Rogers & Salmon*.—*R. micans* Gren. & Godr. Lodsworth Common; not quite typical. —*R. lasioclados* Focke var. *angustifolius* Rogers. Lodsworth Common. — *R. radula* Weihe subsp. *echinatoides* Rogers. Lodsworth Common. — *R. Babingtonii* Bell Salt. Jays Furze, Lavington.—*R. Lejeunei* Wh. & N. var. *ericetorum* Lefv. Jays Furze, Lavington; Lodsworth Common. — *R. fuscus* Wh. & N. Between Graffham and East Dean (with var. *nutans* Rogers); Lodsworth Common.—*R. foliosus* Wh. & N. Between East Dean and Graffham; Lodsworth Common.—*R. rosaceus* Wh. & N. var. *hystrix* (Wh. & N.). Selham. —Subsp. *infecundus* Rogers. Between Graffham and East Dean; Lodsworth Common. — *R. Koehleri* Wh. & N. subsp. *dasyphyllus*

Rogers. Between Graffham and East Dean. — [*Fragaria elatior* Ehrh. I. Hedge-bank, near a cottage, between Upwaltham and Eartham. II. Copse above Amberley Station.] — *Potentilla procumbens* Sibth. Bignor; Coates; Lodsworth.—*Rosa pimpinellifolia* L. II. Downs above Amberley. — *R. rubiginosa* L. I. Plentiful between Chilgrove and West Dean; Cocking. II. Downs above Amberley.—*R. micrantha* Sm. I. About Arundel and Slindon; West Stoke, &c.; Lodsworth Common. II. Frequent on the downs above Parham, Rackham, and Amberley. — *R. obtusifolia* Desv. Cocking. — *R. stylosa* Desv. var. *systyla* (Bast.). I. Cocking; Pagham. II. Amberley. — *Pyrus acerba* DC. I. Kingley Vale, near West Stoke. II. Parham.

Sedum anglicum L. West Wittering.

Myriophyllum spicatum L. Pagham. — *Callitriche hamulata* Kuetz. II. Parham; Amberley. — *C. obtusangula* Le Gall. West Wittering.

Peplis Portula L. Lodsworth Common.—*Lythrum Salicaria* L. Wiggonholt; Amberley. The only known Sussex station for *L. Hyssopifolia* L., near West Wittering, has apparently been destroyed by the inroads of the sea.

Epilobium angustifolium L. Woods near Slindon; Houghton Forest. — *E. adnatum* Griseb. Cocking. — *E. Lamyi* F. Schultz. Midhurst, *Rogers & Salmon!*

Eryngium maritimum L. West Wittering; *Conium maculatum* L. also grows there. — *Apium graveolens* L. Pagham. — *Crithmum maritimum* L. West Wittering; also *Œnanthe Lachenalii* C. Gmel.

Adoxa Moschatellina L. Slindon; Selham.

Galium Mollugo × *verum*. Duncton; a form closely approaching *verum*. — *G. uliginosum* L. Abundant in the damper parts of the wooded downlands between Graffham and East Dean; also near Upwaltham—unusual situations for this species.

Valeriana Mikanii Syme. Plentiful about Slindon, Eartham, and Houghton; West Stoke. — *V. sambucifolia* Willd. I. West Wittering. II. Amberley.—*Valerianella olitoria* Poll. II. Plentiful on railway-banks at Pulborough.—*V. dentata* Poll. Near Pagham.

Scabiosa Columbaria L. I. Slindon; Upwaltham; Cocking. II. Rackham; Amberley.

Filago apiculata G. E. Sm. I. Selham, locally abundant; sandy roadsides near Burton Mill. II. Wiggonholt. — *F. minima* Fr. Selham; Pagham. — *Gnaphalium sylvaticum* L. Bank near Fittleworth Station. — *Inula Conyza* DC. I. Slindon, Eartham, Houghton, &c.; West Stoke, &c. II. Amberley.—*Pulicaria vulgaris* Gaertn. Dried-up pond on Lodsworth Common, very scarce; with *Bidens tripartita* L.—*Achillea Ptarmica* L. I. Lodsworth Common. II. Amberley. — *Anthemis arvensis* L. Sandy ground, Selham.— *Matricaria inodora* L. var. *salina* Bab. West Wittering. — *Senecio sylvaticus* L. Graffham; Selham; Coates; West Wittering.— *Carlina vulgaris* L. I. Houghton; Bignor; Cocking; West Stoke. II. Downs, Amberley to Parham.—*Carduus pycnocephalus* L. West Wittering. — *C. crispus* × *nutans*. II. Amberley.—*Crepis taraxacifolia* Thuill. West Wittering, on the shingles.

Hieracium sylvaticum Gouan var. *pellucidum* Williams (*H. murorum* auct., var.). Sparingly in Combe Wood, near Houghton.—*H. boreale* Fr. I. Lodsworth. II. Wiggonholt.—*Hypochæris glabra* L. Selham, *Salmon !*—*Taraxacum erythrospermum* Andrz. I. Selham. II. Wiggonholt. — *T. palustre* DC. var. *udum* (Jord.). I. About Slindon and Eartham; Bignor; Coates: West Stoke; West Wittering. II. Wiggonholt; Parham. Not confined to wet places.

Phyteuma orbiculare L. I. Cocking. II. Amberley.—*Campanula glomerata* L. Cocking. — *Specularia hybrida* A. DC. Near Heyshott.

Erica Tetralix L. II. Wiggonholt.

Statice Limonium L. West Wittering.

Lysimachia vulgaris L. Near Fittleworth.— *L. Nummularia* L. II. Wiggonholt.

Blackstonia perfoliata Huds. Pagham; Cocking; locally plentiful on the chalk, Graffham.—*Menyanthes trifoliata* L. II. Amberley.

Cynoglossum officinale L. I. Bury Hill. II. Wiggonholt.—*Myosotis collina* Hoffm. I. Abundant at Kingley Vale, near West Stoke. II. Hurston Warren; Wiggonholt Common.—*Lithospermum officinale* L. Bury Hill; Bignor; West Stoke.—*Echium vulgare* L. Slindon.

Volvulus Soldanella Junger. West Wittering.

Atropa Belladonna L. Bury Hill; Lavington; Graffham; Cocking.—*Hyoscyamus niger* L. Pagham.

Verbascum nigrum L. I. Slindon; Cocking. II. Wiggonholt. —*Veronica arvensis* L. var. *eximia* Towns. II. Well-marked on Hurston Warren, near Wiggonholt. — *V. montana* L. Selham.—*V. scutellata* L. Lodsworth Common. — *Euphrasia Rostkoviana* Hayne. Lodsworth Common; Lavington. — *E. nemorosa* Pers. Pagham.

Salvia Verbenaca L. West Wittering. — *Scutellaria minor* L. Lodsworth Common.—*Lamium purpureum* L. var. **decipiens* Sonder. West Wittering; scarce. Mr. Bennett considers it to be correctly named.

Atriplex hastata L. West Wittering. *A. laciniata* L. occurs sparingly here, and plentifully near Pagham, towards Earnley.

Salicornia radicans Sm. and *Suæda maritima* Dum. West Wittering.

Rumex pulcher L. West Wittering.

*Daphne Laureola × Mezereum, n. hybr. North Wood, near Slindon. I was making a special search for *D. Mezereum* in this neighbourhood (unsuccessfully, though I ascertained from a woodman that the plant still grows thereabouts), when I came upon a bush which, at some distance, greatly resembled it; being about 3 feet high, much branched from near the base, with ascending, nearly straight branches. The leaves (on April 21st) were very young, only ½ to 1 inch long, much as in *D. Mezereum* at the same stage, and similarly veined; but somewhat thicker and shining. The flowers were mostly in threes, less decidedly terminal than in *D. Laureola*, but quite glabrous and green, though often reddish-tinged externally. As *D. Laureola* with deciduous leaves is un-

known, and the habit, bark, &c., also recall *D. Mezereum*, I believe that it is probably *Laureola* ♀ × *Mezereum* ♂. Focke mentions artificial hybrids as having occurred in the genus. Unfortunately, my cuttings, and others sent to Mr. Bennett, failed to grow; and I could not manage to revisit the spot later in the season. The following careful note from Mr. Salmon strongly confirms my view:—"Seems to me to show characters of both *Laureola* and *Mezereum*. The flowers (green and glabrous) and bracts seem to be those of the former; the veining of the leaves and their being deciduous and appearing after the flowers point to the latter. It appears, from books, that *D. Mezereum* sometimes varies with white flowers; but I think the tube of the corolla is always more or less hairy in the specimens I have examined. The examples you sent me match well good *D. Mezereum* I gathered near Lewes, *until one examines them with a lens!* I do really think it is either *D. Mezereum* × *Laureola*, or else another species I am unfamiliar with." *D. Laureola* is not uncommon in the neighbourhood; but I did not observe it close by.

[*Euphorbia Esula* L. Railway-bank close to Selham Station; probably of accidental introduction].— *E. Paralias* L. West Wittering; plentiful on the shingly "Spit."

Parietaria officinalis L. Slindon; Houghton; Bignor; Pagham.

Juniperus communis L. II. Downs above Rackham.

Orchis pyramidalis L. Sparingly on the coast at Pagham.—*O. latifolia* L. West Wittering.—*Herminium Monorchis* R. Br. Cocking; Graffham Down, *Wolley-Dod!*

Narcissus Pseudo-narcissus L. Growing with the type in a meadow at Graffham, where it is unquestionably native, I found two plants with double flowers; and a third with the tube sulphur-yellow, only about half the length of the perianth-segments, irregularly cut.

Juncus maritimus Lam. West Wittering.

Lemna polyrrhiza L. I. West Wittering. II. Amberley.

Alisma lanceolatum With. Pagham.

Potamogeton polygonifolius Pour. II. Near Wiggonholt.— *P. densus* L. I. West Wittering. II. Parham; Amberley.— *Zannichellia pedunculata* Reichb. West Wittering; where I also observed *Zostera nana* Roth. and *Z. marina* L. var. *angustifolia* Hornem.

Scirpus setaceus L. and *S. Tabernæmontani* Gmel. Pagham.—*S. sylvaticus* L. Selham; near Fittleworth.—*Carex arenaria* L. Inland on Coates Common, covering nearly an acre. —**C. Leersii* F. Schultz (*C. muricata* var. *pseudo-divulsa* Syme). Between Chichester and Pagham; West Wittering. — *C. Goodenowii* J. Gay. West Wittering.—*C. binervis* Sm. West Wittering.—*C. acutiformis* Ehrh. var. *spadicea* (Roth). II. Near Wiggonholt.

Alopecurus bulbosus Gouan. West Wittering.—*Milium effusum* L. Frequent about Arundel and Slindon. — *Phleum pratense* L. var. *nodosum* (L.). West Wittering; also *Ammophila arundinacea* Host. —*Avena pubescens* Huds. Not uncommon about West Stoke, Chilgrove, and West Dean. — *Arrhenatherum avenaceum* Beauv. var. *nodosum* Reichb West Wittering. — *Molinia varia* Schrank. I.

Coates Common. II. Wiggonholt. — *Catabrosa aquatica* Beauv. West Wittering.—*Glyceria plicata* Fr. West Wittering; Pagham. —*G. fluitans* × *plicata* (*G. pedicellata* Towns.). Pagham.— *G. declinata* Bréb. West Wittering; Lodsworth Common.—*G. distans* Wahlenb. and *G. Borreri* Bab. West Wittering.—*Festuca procumbens* Kunth. An erect form was found near West Wittering, growing on half-dried mud. — *F. rottboellioides* Kunth. Pagham; West Wittering.—*F. Myuros* L. I. Pagham. II. Amberley.—*F. sciuroides* Roth. Pagham; West Wittering. — *F. ovina* L. var. *capillata* Hack. I. Selham. II. Wiggonholt.—*Bromus commutatus* Schrad. II. Amberley.—*Agropyron caninum* Beauv. II. Amberley. —*A. pungens* R. & S. Pagham; West Wittering. — *A. junceum* Beauv. West Wittering.—*Lepturus filiformis* Trin. Pagham; West Wittering. — *Hordeum secalinum* Schreb. and *H. marinum* Huds. Pagham; West Wittering.—*Polystichum lobatum* Presl. Near West Wittering.

Equisetum maximum Lam. Between Fittleworth and Petworth, in the Rother valley.

Chara vulgaris L. II. Amberley.

ON *ZYGOSTIGMA*.

By Frederic N. Williams, F.L.S.

Zygostigma *Griseb.* Gen. Spec. Gentian. p. 150 (1839).—*Meissn.* Plant. Vasc. Gen. i. p. 260, ii. p. 169 (1840).—*Spach*, Hist. Nat. Veg. ix. p. 5 (1840).—*Endl.* Gen. Plant. suppl. p. 1399 (1840); Ench. Bot. p. 302 (1841).—*Reichb.* Nomencl. Bot. p. 132 (1841).—*Griseb.* in *Cand.* Prodr. ix. p. 51 (1845).—*Lindl.* Veg. Kingd. p. 614 (1847).—*Progel* in *Mart.* Fl. Brasil. vi. pt. 1, p. 202 (1865).—*Benth. & Hook. f.* Gen. Plant. ii. p. 810 (1876).—*Dur.* Ind. Gen. (1888).—*Baill.* Hist. Pl. x. p. 135 (1889).—*Engl. & Prantl*, Natürl. Pflanzenf. iv. abt. 2, p. 94 (1895).—*Jacks.* Ind. Kew. ii. p. 1257 (1895).

Calyx angustus profunde partitus, segmentis valvaribus strictis carinatis in tubum brevem connexis. Corolla infundibuliformis, tubo marcescente, limbo partito. Stamina fauci inserta, filamentis brevibus; antheræ lineares, erectæ, immutatæ vel parum recurvæ. Ovarium uniloculare, placentis parum intrusis. Stylus brevis; stigma bicrure, lobis oblongo-linearibus erectis conniventibus. Capsula bilvalvis septicida, valvarum marginibus inferne valde superne minus intrusis. Semina numerosa minuta foveolata.—Herbæ erectæ tenues rigidulæ, simplices vel parum ramosæ. Folia opposita sessilia. Flores longe pedicellati, solitarii vel pauci, rosei vel violacei.

Genus meridionali-Americanum, subtrib. Erythræoidearum, trib. Chironiearum, subfam. Gentianinarum. *Sabbatiæ* affine, species 2 includens.

1. Zygostigma australe Griseb. l. c.

Perenne. Radix lignescens subsimplex fusca. Caules $4\frac{1}{2}$–$5\frac{1}{2}$ dcm., angulis tenuiter alatis tetragoni; internodiis superioribus quam

folia longioribus. Folia radicalia cum caulinis infimis ovato-lanceolata obtusa palmatinervia sub anthesi marcescentia evanescentia; cetera circiter 6 mm., erecta adpressa anguste lineari-lanceolata acuminata 3-nervia, nervo medio subtus prominente, margine sat revoluta; phylla floralia minora subsimilia. Ramificatio florifera determinata laxa; pedunculi $2\frac{1}{2}$–$7\frac{1}{2}$ ctm., bis interdum terve stricte dichotomi uniflori erecti. Calyx 12 mm., superne attenuatus; segmenta patula lanceolata-linearia acuminata 3-nervia, nervo mediano carinato-prominente. Corolla 24 mm. rosea subcoriacea demum pergamenea; tubus cylindricus nervosus tenuis, limbo parum brevior, calycem paullo excedens; laciniæ elliptico-lanceolatæ acutæ. Filamenta antheris breviora; antheræ sagittatæ exsertæ demum subtortæ. Capsula valvulis late introflexis fere bilocularis, a corollæ tubo aucto marcesente circumvelata. Semina fusca gyroso-rugosa late areolata.

Syn.—*Sabbatia australis* Cham. & Schlecht., in Linnæa, i. p. 194 (1826).

Hab. Brazil: Caldas and Pedra Branca, in the province of Minas Geraes, 1867 (*Regnell*, iii. n. 895[1], in herb. Holm., ex *O. A. Malme*, Adjum. Fl. Phanerog. Brasil. p. 20, in Bihang t. Kongl. Svensk. Vetensk. Acad. Handling. xxiv. n. 6 [1898]).—Uruguay: Braxuelo (*Sello* in Herb. Kew., duplicates of original type-specimens in Herb. Berolin.), Montevideo (*Howard* in Capt. King exped., Herb. Mus. Brit. ex. herb. Miers, n. 7992, and duplicate in Herb. Kew), on moist sand near Montevideo, 1869 (*Gibert*, n. 929, in Herb. Kew.), in lat. 34° 54′, 1838 (*Isabelle* in Herb. Kew.), and without locality, collected between 1816 and 1821 (*St. Hilaire*, n. 2306, in Herb. Kew., the earliest available specimens).—Argentina: Rio de la Plata (*Sello* in Herb. Berolin.).—Paraguay: in the plain of San Blas (*E. Hassler*, exs. 1885–1900, n. 5749, in Herb. Boiss., ap. Bull. Herb. Boiss. 1901, p. 442).

Iconogr.—*Mart.* Fl. Brasil. vi. pt. 1, p. 202, t. 55 (1865).

In the specimens from the coast the stems are few, and slightly branched in the upper part. In the more luxuriant specimens from the open country inland, the stems are more numerous, with larger flowers, and the plant has also short barren shoots with several pairs of leaves broader than those of the flowering stems. In the coast specimens there are eight or nine pairs of leaves, and in the luxuriant form twelve or thirteen pairs. In the examples distributed by Glaziou (n. 9246), cultivated in the Botanic Gardens of Rio de Janeiro, the calyx is divided into four segments instead of five; and the four ridges along the stem are continued through the branching right up to the flower, where each becomes the median nerve of the segments of the calyx.

The earlier records are given as Brazilian, at the time when Uruguay was a province of Brazil.

2. Zygostigma uniflorum Griseb. l. c.

Annuum. Radix tenuis filiformis subsimplex fuscescens. Caulis $1\frac{1}{2}$–2 dcm., teres uniflorus; internodiis inferioribus quam folia brevioribus, superioribus quam folia multum longioribus. Folia

inferiora 8 mm., ovali-subrotunda vel late elliptica obtusa 3-nervia, nervo medio subtus prominente, superiora sensim decrescentia lanceolata vel (suprema) linearia acuminata 1-nervia. Calyx superne angustatus; segmenta ovata acuminata, dorso leviter carinata, margine membranacea. Corolla 16 mm., violacea; tubus ellipsoideus, limbum æquans, calyce longior; laciniæ ellipticæ subobtusæ. Antheræ sagittatæ exsertæ demum immutatæ.

Syn.—*Erythræa uniflora* Hook. & Arn. in Journ. Bot. i. p. 285 (1834).

Hab. Uruguay: shore of Rio de la Plata, near Montevideo (*Tweedie*, n. 448, in Herb. Kew., the type-specimens).—Argentina: open places near Buenos Aires, along the Rio de la Plata (*Tweedie*, 1837, in Herb. Hew.). The original specimens were collected by Tweedie in 1833, and sent to Hooker. In the following year the plant was described in the first volume of the new botanical journal, founded by Hooker, as a species of *Erythræa*. The leaves on the stem vary from eight to eleven pairs, according to its length. The top pair, 24 mm. below the flower, are indistinguishable from bracts.

The range of the two species, which at present constitute the genus, extends from Caldas and Pedra Branca in Brazil, lat. 20°, to Buenos Aires in Argentina, and the south coast of Uruguay, lat. 35°; and westward to the plain of San Blas in Paraguay. As far as can be ascertained from the specimens available, they do not seem to rise much above the shore-level. In the fine collection of the plants of Paraguay, extending over several years, made by M. Emile Hassler, and now being worked out under the supervision of Prof. Chodat, the Swiss botanist states that on account of the slight differences in elevation of the various districts visited, heights are not given on the labels attached to specimens. The same applies in the case of other collectors in the plains of Eastern South America.

The genus is distinguished from *Erythræa* and *Sabbatia* in the connivent lobes of the stigma, and also from the latter by the long corolla-tube.

THE INDIGOFERAS OF TROPICAL AFRICA.

By Edmund G. Baker, F.L.S.

(Continued from p. 194.)

Group IV. Trifoliolatæ. Leaves digitately trifoliolate. Racemes axillary.

48. I. tritoides Baker in Kew Bull. 1895, p. 214.

I. tenuisiliqua Schwein. *l. c.* p. 241 (1896); Chiov. in Ann. Ist. Roma, 1903, p. 92.

I. leptocarpa Hochst. & Steud. in Herb. Schimp. Arab. no. 771 (nomen), ex Schweinf. *l. c.* non Ecklon, Zeyher.

Hab. Nile Land. Between Suakin and Berber, *Schweinfurth*, no. 297! Geddah, *Hildebrandt*, no, 159! Eritrea, *Schweinfurth &*

Riva, no. 369 a ! Nubia, about lat. 21°, *Bent* ! Somaliland. Golis Range near Dara-as, *Miss Edith Cole*, no. 268 ! Rugga Pass and Wagga Mt., *Mrs. Lort Phillips* ! Gedais, *Mrs. Lort Phillips* ! Dimoleh, *Gillett & Aylmer* !

Group V. Conjugatæ. Leaflets 2, terminal one large, lateral one smaller.

* Leaflets suborbicular or broadly ovate, argenteous.

49. I. diphylla Vent. Choix, p. 300, t. 30 (1803); Baker, *l. c.* p. 74 (1871).

Hab. Nile Land. Kordofan, *Kotschy*, no. 5 ! *Dr. Pfund* ! Upper Guinea. Senegambia, *Perrottet* ! Lower Guinea. Longa, *H. Baum*, no. 668 ! East Tropical Africa. Mozambique, *Dr. Peters*. Damaraland. *Een* !

In var. *β lanuginosa* DC. Prod. ii. p. 223, the leaves are lanuginose-strigose, and the stem and legumes very hispid.

** Leaflets oblanceolate, glabrescent.

50. I. conjugata Baker in Flor. Trop. Afr. ii. p. 75 (1871).

Hab. Nile Land. Banks of the White Nile, *Petherick* ! Herb. Kew.

Group VI. Paniculatæ. Leaves imparipinnate. Flowers in panicles.†

* Leaflets 13–17.

51. I. Brassii Baker, *l. c.* p. 76.

Hab. Upper Guinea. Cape Coast, *Brass* ! Herb. Mus. Brit.

** Leaflets 3–7, rarely 1. Stipules large, ovate or ovate-lanceolate.

52. I. sericea Benth. ex Baker, *l. c.* p. 76 (1871).

Hab. Upper Guinea. Senegambia, *Heudelot* ! &c.; Niger, *Barter*. South Central. In the interior near the Tropic of Capricorn, *Baines & Chapman* ! British Central Africa. Nyassaland, *Buchanan* (1881), no. 335 !

Forma australis. Caulis quam typus tenuior. Folia simplicia vel trifoliolata. Foliola quam ea typi breviora 6–9 mm. longa, 4–5 mm. lata. Stipulæ conspicuæ ovato-lanceolatæ mucronatæ. Pedunculi plerumque 2-flori. Calycis lobi longi quam tubus multoties longiores strigoso-hirsuti. Carina obtusa 3·5 mm. longa calcarata. Ovarium pluriovulatum. Legumen haud visum.

Hab. South Central. Buluwayo, *R. Frank Rand*, no. 59 ! Herb. Mus. Brit.

In flower, early January, 1898.

I. sericea L. Mant. ii. p. 271 belongs to *Amphithalia*.

*** Leaflets 3–10. Stipules linear, deciduous.

53. I. bracteolata DC. Prod. ii. p. 223 (1825); Guill. & Perr. Fl. Seneg. i. p. 176 (1833); Baker, *l. c.* p. 77.

Crotalaria bracteolata Perr. ex DC. *l. c.*

Hab. Upper Guinea. Senegal, *Perrottet*, no. 198 ! *Heudelot*, no. 422 ! Niger, *Barter* ! Nile Land. Aethiopia, *Kotschy*, no. 553 !

† *I. Dupuisii* M. Micheli, *I. pulchra* Willd., and *I. nigricans* Vahl agree with this group in having a paniculate inflorescence.

Group VII. Capitatæ. Leaves imparipinnate, 3–5-jugate. Flowers in dense terminal heads. Bracts conspicuous, pinnate, or subpinnate, with narrow linear divisions. Pod 1–2-seeded.

54. I. capitata Kotschy in Sitz. Acad. Wien. Math. Nat. li. Abth. ii. (1865), 365, t. 6A; Baker, *l. c.* p. 75; Hiern, *l. c.* p. 208; non R. Graham in Wall. Cat. 5490.

Hab. Upper Guinea. Senegambia, *Heudelot*; Old Calabar, *Mylne*; Sierra Leone, near Digipatu, *Scott Elliot*, no. 4063! Wallia, *Scott Elliot*, no. 4245! Nile Land. Banks of the White Nile, *Binder*, *Petherick*. Open ground at Madi, *Speke & Grant*! Djurland, Seriba Ghattas, *Schweinfurth*, no. 2431! Lower Guinea. Congo, *Capt. Burton*. Stanley Pool, *Hens*, no. 85! Gaboon, *Soyaux*, no. 423. Ambriz, *Welwitsch*, no. 2040!

Group VIII. Opertifloreæ. Leaves imparipinnate. Flowers in dense axillary or terminal heads. Bracts conspicuous, ovate or orbicular, generally concealing the flowers.

⊙ Leaflets generally 2–3-jugate, terminal leaflet (in type) conspicuously larger than the rest.

55. I. strobilifera Hochst. in Kotschy, Hb. Nub. no. 236, ex Baker, *l. c.* p. 75.

Eilemanthus strobilifer Hochst. in Flora, 1846, p. 593.

Hab. Nile Land. Kordofan, *Kotschy*, no. 236! *Cienkowsky*, *Dr. Pfund*. Banks of the White Nile, *Von Varnier*. East Tropical Africa. Mozambique, *Forbes*. Zanzibar, *Hildebrandt*, no. 937! Mombassa, *Hildebrandt*, no. 9276!

⊙⊙ Leaflets pinnately trifoliate.

56. I. lupulina Baker in Kew Bull. 1897, p. 254.

Hab. British Central Africa. Between Kondowe and Karonga, *Whyte*, no. 336!

⊙⊙⊙ Leaflets generally 5, obovate or oblanceolate, terminal leaflets slightly larger than the rest.

57. I. lanuginosa Taubert ex Engler in Abhandl. Preuss. Akad. Wiss. 1894, p. 17 (nomen).

Hab. East Tropical Africa. Tanga, *C. Holst.* no. 2066!

Group IX. Spinosæ. Leaves imparipinnate, or sometimes trifoliolate. Strong spiny bushes with flowers from the spines.

58. I. spinosa Forsk. Fl. Aegypt.-Arab. p. 137 (1775); Jaubert & Spach. Illustr. Pl. Or. t. 491 (1853–57); Baker, *l. c.* p. 77 (1871).

Hab. Nile Land. Suakin, *J. K. Lord*. Between Suakin and Berber, *Schweinfurth*, no. 447! Eritrea, *Schweinfurth*. Abyssinia, *Salt*! *Schimper*. Nubia, *Ehrenberg*. Somaliland, *Miss E. Cole*! *Riva*, *Robecchi-Brichetti*. Harrar, *Robecchi-Brichetti*.

Var. *spiniflora* Schweinf. in Bull. Herb. Boiss. 1896, App. ii. p. 237.

I. spiniflora Hochst. & Steud. in Schimper, Unio Itin. 1837, no. 945.

Hab. Nile Land. Eritrea, *Schweinfurth*.

Var. *grandifolia* Schweinf. *l.c.*
Hab. Nile Land. Eritrea, Geleb, *Schweinfurth.*
Var. *microphylla* A. Rich. Fl. Abyss. i. p. 185 (1847).
Hab. Nile Land. Abyssinia, *Petit.*
Forma *densissima* Chiov. in Ann. Ist. Roma, 1903, p. 91.
I. spinosa, Terrac. Fl. Anfilah, p. 23.
Hab. Nile Land. Eritrea.

59. I. Rothii Baker, *l.c.* p. 77.
Hab, Nile Land. Abyssinia, *Roth* !
The pod is densely covered with stalked glands.

Group X. Trichopodæ. Leaves imparipinnate. Flowers solitary or geminate on slender peduncles from the axils of the leaves.†

* Peduncles 2·5–5·0 cm. long.

60. I. trichopoda Leprieur in Guill. & Perr. Fl. Seneg. p. 177, t. 47 (1833) ; Baker, *l. c.* p. 78 (1871).
Hab. Upper Guinea. Senegal, *Perrottet*, no. 180 ! *M. Bidjem* ! Senegambia, *Heudelot*, no. 272 !

** Peduncles 1·5–2·0 cm. long (in *I. sparsa* Baker, var. *bongensis* Bak. fil., shorter). Herbaceous, slender. Leaflets 3–7.

61. I. sparsa Baker *l. c.* p. 79.
Hab. Nile Land. Abyssinia, *Schimper* (1863), no. 204 ! type. Galla Territory. Turro, *Riva.*

Var. nov. **bongensis.** Annua. Caulis tenuis herbaceus erectus ramosus ± 10 cm. altus. Folia plerumque pinnatim trifoliolata foliola subtus pallidiora oblonga vel oblongo-lanceolata quam foliola typi longiora et angustiora 5–9 mm. longa, 2·5–3 mm. lata. Pedunculi graciles 1–2-flori, 5–10 mm. longi. Legumen subcylindricum rectum polyspermum (8–12) mucronatum glabrum.
Hab. Nile Land. Bongoland, Gir, *Schweinfurth*, no. 2526 ! ; *Schimper*, no. 2009, from Mai Mezano, Abyssinia, is very closely allied to *I. sparsa.*

*** Peduncles 1·0–1·5 cm. long.

⊙ Herbaceous. Legume strigose, 8–15-seeded. Leaflets generally 7–9, oblong-obovate.

62. I. ambelacensis Schwein. in Bull. Herb. Boiss. 1896, App. ii. p. 237.
Hab. Nile Land. Eritrea, Ambelaco, *Schweinfurth.*

⊙⊙ Suffruticose. Legume strigose or glabrescent, ∞-spermous. Leaflets 9–13, small, oblong, or oblanceolate.

63. **I. brevicalyx,** sp. nov. Suffrutex. Radix lignosa. Multicaulis. Caules diffusi ascendentes ramosi teretes deorsum glabri vel glabriusculi sursum griseo-strigosi. Folia imparipinnata breviter petiolata sæpissime 4–6-jugata. Foliola inter minora generis oblonga vel oblanceolata superne glabra subtus griseo-strigosa

† *I. nigritana* Hk. f., *I. cuneata* Baker, *I. elegans* Schum. & Thonn., and *I. monantha* Bak. fil. agree with this group in the character of the inflorescence.

brevissime petiolulata, lateralibus oppositis terminalibus fere æqualibus. Stipulæ filiformes persistentes. Pedunculi sæpissime patuli filiformes 1–2-flori foliis æquilongi vel paullo longiores. Calyx brevis calycis lobi acuti quam tubus paullo longiores. Legumen rectum sparse strigosum vel glabriusculum polyspermum mucronatum. *I. sparsæ* Baker affinis, differt radice subcrassa lignosa, caulibus multioribus diffusioribus foliolis multioribus et minoribus.

Hab. Nile Land. Abyssinia, Dembea, alt. 6000 ft., *Schimper*, no. 1397, Oct. 27th, 1863.

Root stout, woody, entirely different from that of *I. sparsa*, which is a slender annual. Leaf-rachis 5–8 mm. long. Leaflets small, generally 3–4 mm. long, 1–1·50 mm. broad. Peduncles 8 mm.–1·2 cm. long. Calyx 1·5 mm. long. Legume 8 mm.–1·6 cm. long.

I append a description of a plant which has been referred by Dr. Vatke to *I. suaveolens* Jaubert & Spach. It appears to differ in several important particulars, and may be an undescribed species, but I have not seen flowers :—

Suffruticosa ? *I. sparsæ* Baker et *I. ambelacensi* Schwf. accedens. Caulis ramosus superne incano-strigosus. Folia trifoliolata vel 2–4-jugata rarissime folia simplicia petiolus brevis foliola oblonga utrinque incano-strigosa apice obtusa mucronata, petiolulis brevissimis. Stipulæ subulares. Pedunculi graciles tenues filiformes 1–2-flori pedicelli brevissimi quam calyx breviores. Calycis tubus incano-strigosus lobi setacei quam tubus parum longiores. Calyx quam ovarium ± $\frac{1}{3}$-plo brevior. Ovarium rectum pluriovulatum dense incano-strigosum. Legumen rectum subcylindricum mucronatum sparse strigoso-pubescens ± 10-spermum spermis pallide brunneis.

Hab. Nile Land. Abyssinia, Bogos, *Hildebrandt*, no. 587. Herb. Mus. Brit.

I have placed this plant in the *Trichopodæ* on account of its inflorescence ; the leaves, however, are to some extent heterophyllous.

Group XI. Sessilifloreæ. Leaves imparipinnate. Flowers in sessile clusters in the axils of the leaves.

⊙ Legume ± 6-seeded.

64. I. sessiliflora DC. Prod. ii. p. 228 (1825) ; Baker, *l. c.* p. 79.

Hab. Upper Guinea. Senegambia, *Perrottet*, n. 183 ! *Heudelot*, no. 421 ! Senegal, *Leprieur* !

⊙⊙ Legume 2–3-seeded.

65. I. trigonelloides Jaubert & Spach, Illustr. t. 482 (1853–57); Baker, *l. c.* p. 79 (1871).

I. asperifolia Hochst. in Schimp. Hb. Abyss. no. 2272.

I. æruginis Schweinf. Fl. Aeth. p. 11 (1867).

Hab. Nile Land. Abyssinia, *Schimper*. Near Gageros, *Schimper*, no. 2272 ! (1854).

Group XII. Dissitifloreæ. Leaves imparipinnate (rarely sometimes simple in *I. suaveolens* Jaub. & Spach). Flowers generally in lax 2–6-flowered racemes, rarely more flowered.†

A. Racemes short, subsessile or shortly stalked.

(*a*) Leaflets 9–11, oblanceolate. Slender branching annual.

66. I. concinna Baker, *l. c.* p. 80 (1871).

Hab. East Tropical Africa. Zambesiland, *Sir John Kirk*! *Dr. Meller*!

The following may be a variety of *I. concinna*, but I have not seen the legumes :—

Herbaceous, branching. Leaflets 5–7, narrow, oblong or oblanceolate, mucronate, lateral leaflets opposite, rachis 5–8 mm. long, lamina ± 5 mm. long, ± 2 mm. broad at the broadest point, strigosely hairy, midrib impressed above. Stipules persistent, subulate. Racemes axillary, few-flowered. Peduncles shorter than the leaves, slender, under 1 cm. long. Calyx-tube strigosely hairy, lobes narrow lanceolate.

Hab. British Central Africa. North Nyassaland and Upper Loangwa River Expedition near Fort Young, *Dr. T. G. Nicholson*! Herb. Kew.

(*b*) Leaflets 5–7, oblong or elliptical. Herbaceous but suffruticose at base.

67. I. arenophila Schinz in Bull. Herb. Boiss. vi. p. 524 (1898).

Hab. Amboland. Olukonda, *Rautanen*, no. 215 !

(*c*) Leaflets 3–7, oblong or oblanceolate or obovate oblong. Annual.

68. I. griseoides Harms in Kunene Sambesi Exp. p. 257 (1903).

Hab. Lower Guinea. Angola. Between Onshingue and Kutue, *Baum*, no. 745, branches of the River Kuito, which is a branch of the River Kubango.

(*d*) Leaflets usually 5, oblanceolate-cuneate. Suffruticose.

69. I. grisea Baker, *l. c.* p. 80, non Desv.

Hab. Upper Guinea. Niger Country, Abbeokuta, *Dr. Irving*! Nupe, *Barter*!

B. Racemes distinctly stalked.

⊙ Suffruticose.

(*a*) Branches below with spreading hairs. Leaflets 5–7, oblanceolate, mucronate. Calyx 4 mm. long.

70. I. nyikensis Baker in Kew Bull. 1897, p. 254.

Hab. British Central Africa. Nyika Plateau, alt. 6000–7000 ft., *Whyte*, no. 151 !

(*b*) Branches adpressedly white-pilose. Leaflets 7, oblanceolate, mucronate. Calyx 4 mm. long.

71. I. microscypha Baker, *l. c.* p. 255.

Hab. British Central Africa. Between Mpata and the com-

† The racemes are generally more than 6-flowered in *I. pilosa* Poir. var. *multiflora* Bak. fil., *I. laxeracemosa* Bak. fil., in *I. multijuga* Baker, and in *I. dendroides* Jacq.

mencement of the Nyasa-Tanganyika Plateau, alt. 2000–3000 ft., *Whyte*.

(*c*) Leaflets 3, rarely 5, occasionally 1. Stipules setaceous. Calyx ± 2 mm. long.

72. I. SUAVEOLENS Jaub. & Spach. Illustr. t. 489 (1853–57); Baker, *l. c.* p. 80 (1871); Engler, Hochgebirgsflora, p. 257 (1892).

I. sparsiflora Hochst. in Schimp. Hb. Abyss. no. 2288.

I. subquadriflora, Hochst. in Schimp. Hb. Abyss. no. 2001; Chiov. in Ann. Ist. Roma, 1903, p. 90.

Hab. NILE LAND. Abyssinia, *Schimper*, no. 143 (1854)! Near Dschebadscherame, *Schimper*, no. 2001! Scholloda, *Schimper*, no. 417. Bogos, *Hildebrandt*, no. 487. Hababb, *Hildebr.* no. 590. Near Gageros, *Schimper*, no. 2288! Madi, *Speke & Grant*! EAST TROPICAL AFRICA. Kilimanjaro, *H. H. Johnston*! *Volkens*, no. 1811! Witu, *Teede*, no. 104! *Thomas*, no. 168! Tanga, *E. Volkens*, no. 8! Pemba Is., *R. N. Lyne*, no. 109! BRITISH CENTRAL AFRICA. Galunka, *T. Kaessner*, no. 832!

Dr. Chiovenda (*l. c.*) retains *I. subquadriflora* Hochst. as distinct, and records it from Gheleb-Caroscebir and Gheleb-Curo.

(*d*) Leaflets 1–2-jugate, small, obovate or oblong. Stipules linear, subulate. Calyx 1 mm. long.

73. I. UHEHENSIS Harms in Engl. Jahrb. xxviii. p. 402 (1900).

Hab. EAST TROPICAL AFRICA. Uhehe, Mbigiri, *Goetze*! no. 508 (408 in Herb. Kew).

(*e*) Leaflets 2–3-jugate, oboval oblong. Stipules subulate. Calyx 2·5–3·0 mm. long.

74. I. PARVULA Delile in Caill. Voy. Meröe Cent. pl. pp. 38, 39, vol. ii. tab. 3, fig. 1 (1826); Baker in Fl. Trop. Afr. ii. p. 81; Schweinf. *l. c.* p. 239 (1896) ?.

Hab. NILE LAND. Abyssinia, near Gennia, *Schimper*, no. 269! Scholloda, *Schimper*, no. 422 (1862)! Eritrea, *Schweinfurth*. Galla Territory, between Tumpi and Ciaffa, *Riva*.

Dr. Schweinfurth doubts the identity of Hochstetter & Steudel's *I. parvula* with that of Delile. He considers the latter may be identical with *I. alternans* DC. var. *paucijuga* Schweinf. from Mt. Erkauit, south-west of Suakin, Schweinfurth, no. 247 (1868). The plants certainly differ in the stipules, which in *I. parvula* Hochst. & Steud. are foliaceous, while in *I. parvula* Delile they are described as subulate.

(*f*) Leaflets generally 3, varying from 1–7, obovate, oblong, or lanceolate. Legume 4–8-seeded.

75. I. SOFA Scott Elliot in Journ. Linn. Soc. xxx. p. 76 (1894).

Hab. UPPER GUINEA. Sierra Leone Region, Mt. Kofiu, *Scott Elliot*, no. 4613; near Falaba, *Scott Elliot*, nos. 5083! 5080! Duunia, Talla, *Scott Elliot*, no. 4831!

(*g*) Leaves 3–4-jugate. Leaflets linear, subulate. Ovary multi-ovulate.

76. I. DISSITIFLORA Baker in Journ. Linn. Soc. xv. p. 93 (1876).

Hab. British Central Africa. Tanganyika, *Cameron* !

Differs from *I. pentaphylla* L. by shape of leaflets and shrubby habit.

(*h*) Suffruticose? Leaflets 5–7, obovate. Legume 10–12-seeded.

77. I. congolensis De Wild. & Th. Dur. in Bull. Herb. Boiss. Tome i. (2nd ser.), p. 11 (1900).

Hab. Lower Guinea. Congo Region, Kisantu, *Gillet*, no. 732.

(*i*) Leaflets 5–9, ovate or oblong. Legume at maturity glabrous, 6–7-seeded.

78. **I. laxeracemosa,** sp. nov.—Suffrutex. Caules patuli decumbentes glabri vel glabriusculi teretes. Folia imparipinnata 2–4-jugata. Foliola ovata vel oblonga glabra vel leviter strigosa breviter petiolulata, lateralibus oppositis, subsimilia iis *I. meladeniæ* Benth. Racemi laxiuscule 10–15-flori. Flores breviter pedicellati. Calycis tubus brevis lobi anguste lanceolati. Legumen glabrum coriaceum nigrum sæpissime 6–7-spermum mucronatum. Ab. *I. pentaphylla* Lin. differt foliolis sæpissime multioribus floribus multioribus et leguminibus crassioribus.

Hab. Mozambique District. Delagoa Bay, *Lieut. Speke*, no. 14! *W. L. Scott* ! Kongone, mouth of Zambesi, *Kirk* !

This plant has been placed with *I. pentaphylla* L., but differs in several points. The leaves are subsimilar to those of *I. meladenia* Benth., but the legumes are very diverse.

Delagoa Bay is south of the Tropic of Capricorn.

Root descending, 15 cm. or more. Flowers "blue or pink." Legume shining, patent or pendulous.

(*j*) Leaflets 3–5, oblong obovate, or oblong, or ovate lanceolate. Legume 1–3-seeded.

79. I. Kuntzei Harms ex O. Kuntze, Revis. Gen. iii. p. 51 (1898).

Hab. East Tropical Africa. Mozambique.

Allied to *I. polycarpa* Benth.

(*k*) Leaflets 4–7-jugate, elliptical or oblong. Legume glandular, straight, 6–10-seeded.

80. I. Zenkeri Harms in Herb. Mus. Brit.—Species *I. glutinosæ* Perr. valde affinis. Suffrutex. Caulis erectus patentim glanduloso-pilosus teres. Folia imparipinnata 4–7-juga foliola elliptica vel oblonga vel obovato-oblonga costa supra impressa subtus pallidiora utrinque strigoso-pubescentia foliolis lateralibus oppositis. Stipulæ subulatæ. Racemi laxiuscule pauciflori. Calycis tubus brevis externe strigoso-hirsutus lobi subulati quam tubus longiores. Legumen rectum densissime et patentim stipitato-glandulosum stylo incurvo filiformi et stigmate capitellato terminatum teres vel subteres 6–10-spermum, spermis rubro-brunneis.

Hab. Upper Guinea. Cameroons, *G. Zenker*, no. 1456! British Central Africa. Nyassaland, *Buchanan* (1891), nos. 1189! 1229! East Tropical Africa. Zanzibar, *Hildebrandt*, no. 948!

Leaf-rachis 3·5–4·5 cm. long, leaflets 6–7 mm. long, 3–4 mm. broad. Peduncles 3·5–4·5 cm. long. Legumes 1·2–1·5 cm. long.

⊙⊙ Herbaceous or suffruticose.

(*a*) Leaflets 7–13, oblanceolate or obovate. Legume glandular, subterete, 10–12-seeded.

81. I. VISCOSA Lam. Encyc. iii. p. 247 (1789); Baker, *l. c.* p. 81.

I. glutinosa Perrottet ex DC. Prod. ii. p. 227 (1825), non Vahl.
I. lateritia Willd. Sp. Pl. iii. p. 1233 (1800).
I. consanguinea Klotzsch in Peters' Mossamb. p. 50 (1862).
I. propinqua Hochst. in Schimper Pl. Abyss. no. 1475.
I. minutiflora Hochst. in Schimper Pl. Abyss. sine numero.

Hab. Widely spread in UPPER GUINEA. NILE LAND. Eritrea. BRITISH CENTRAL AFRICA. Mozambique, also recorded for Galla Territory and Somaliland.

Var. *subglabra* A. Richard, Fl. Abyss. i. p. 181 (1847).

From Abyssinia, Prov. Chire, *Quartin-Dillon*. Prov. Tigre, *Schimper*.

Has been referred to *I. pentaphylla* (=*I. glabra* L.). Lamarck (*l. c.*) suggests the identity of Plukenet's *Colutea siliquosa enneaphylla* (t. 166, fig. 3) with this species; and Plukenet's specimen (Herb. Sloane, xcv. 185) confirms this suggestion.

Var. nov. **somalensis.** Suffruticosa. Caulis ramosus strigoso-pubescens et glandulosus. Folia imparipinnata foliola elliptica vel obovata strigoso-pubescentia. Racemi axillares 2–6-flori. Legumen rectum glandulosum mucronatum 6–8-spermum.

Hab. SOMALILAND. Milmil; in fruit, July 30th, 1894, *Dr. Donaldson Smith*! Herb. Mus. Brit.

Stem not with patent hairs, the glands being subsessile. Leaflets 4–6 mm. long, 2–3 mm. broad. Legume 1·0–1·2 cm. long, pubescent, the glands being subsessile.

(*b*) Leaflets ± 5 obovate or ovate. Legume glabrous when mature, 8–10–12-seeded. In var. *trichocarpa* legume strigose.

82. I. GLABRA L. Sp. Pl. p. 751 (1753).
I. pentaphylla Murr. Syst. Veg. ed. xiii. p. 564 (1774).
I. fragrans Retz. Obs. iv. p. 29 (1786).
I. viscosa var. *subglabra* A. Rich. Fl. Abyss. i. p. 182 (1847), *fide* Fl. Trop. Afr.

Hab. This species has been recorded for various parts of Tropical Africa; conf. Fl. Trop. Afr. ii. p. 82, and Engler, Pl. Ost-Africa, Theil c. p. 210, Chiov. in Ann. Ist. Roma, 1903, p. 90; but the plants I have had an opportunity of examining so named do not agree with Indian material.

There is no uncertainty as to the type, as the specimens on which the species was founded—i. e. *Indigofera leguminibus horizontalibus*, &c., Fl. Zeylanica, 274, and *Colutea siliquosa glabra*, &c., Pluk. Alm. 113, t. 166, f. 1—are both preserved in the National Collection.

Dr. Otto Kuntze (in Revis. Gen. 1898, p. 52) describes a var. *trichocarpa* (i. e. *Anil pentaphylla* O. K. var. *trichocarpa*) from Mozambique, in which the legumes are strigose when mature.

⊙⊙⊙ Herbaceous.

(*a*) Leaflets generally 3 (more rarely 1), elliptical or ovate. Legume 10–12-seeded, or in var. *multiflora* 7–8-seeded.

83. I. PILOSA Poir. Encyc. Suppl. iii. p. 151 (1813); Baker, *l. c.* p. 82 (1871).

Hemispadon pilosus Endl. in Flora, 1832, ii. p. 385, t. 1.

I. guineensis Schum. in Schum. & Thonn. Pl. Guin. 367 (1827).

Hab. UPPER GUINEA. Guinea proper, *Thonning*, *Barter*! Senegambia, *Perrottet*! &c. EAST TROPICAL AFRICA. Unjamwesi.

I. VOHEMARENSIS Baillon, from Madagascar, is a near ally of this species. In this the leaflets are 5, more rarely 3, whereas in *I. pilosus* there are more often 3, and sometimes solitary.

Var. nov. **multiflora.** Caulis erectus pilosus rarius adscendens. Folia sæpissime 3–5-foliolata. Foliola elliptica mucronata utrinque strigoso-pilosa. Stipulæ angustæ. Racemi 8–15–20-flori. Calyx pilosus calycis lobi setacei. Legumen rectum subcylindricum pilosum apice brevissime acutum pilosum, ± 7–8-spermum.

Hab. BRITISH CENTRAL AFRICA. Nyassaland, *Buchanan*, no. 154 (1896)! no. 824 (1891)! *Buchanan*, no. 292! (1891); *Buchanan*, no. 413 (1891)!

Differs from the type in the racemes being 8–15–20-flowered, instead of solitary, or in lax racemes of 2–4 flowers. The calyx-lobes are longer, and the pod shorter and fewer-seeded. It is allied to the Mascarene *I. vohemarensis* Baillon.

Var. nov. **angolensis.** Herba annua gracilis caulibus prostrato-adscendentibus. Folia plerumque trifoliolata, foliola late ovata vel elliptica vel late obovata utrinque strigoso-pubescentia, foliolis lateralibus minoribus. Stipulæ lanceolatæ acuminatæ. Racemi axillares sæpissime 3–4-flori. Flores minimi rosei. Calyx quam calyx præcedentis multo brevior lobi lineares. Legumen maturum glabrum rectum subcylindricum mucronatum 10–12-spermum.

Hab. LOWER GUINEA. Angola, Loanda, *Welwitsch*, no 2022!

Differs from type in having legumes glabrous at maturity, and 3–4-flowered racemes; the calyx is slightly shorter, and the stipules are broader at the base. Leaflets (terminal) 1·5–1·8 cm. long; (lateral) 7 mm.–1·2 cm. long. Legume 1·0–1·7 cm. long.

(*b*) Leaflets 3–5, oblanceolate. Legume ± 4-seeded.

84. I. GEMINATA Baker in Oliver Fl. Trop. Afr. ii. p. 81 (1871).

Hab. UPPER GUINEA. Banks of the Niger at Nupe, and of the Quorra at Jeba, *Barter*! GALLA TERRITORY. Dscharibule, *Riva*.

(*c*) Leaves 2–3-jugate; leaflets linear oblong or narrow oblanceolate. Legumes straight, subcompressed, at length glabrous, ± 8-seeded.

85. **I. Wituensis,** sp. nov. Herbaceus copiose ramosus ramis divaricatis adscendentibus. Caulis teres fere glaber. Folia brevissime petiolata imparipinnata 2–3-juga foliola lineari-oblonga vel angusti-oblanceolata mucronata utrinque strigoso-pubescentia petiolulis brevissimis. Stipulæ subulares. Pedunculi graciles filiformes axillares patentes vel erecto-patentes sæpissime 2–3-flori

folia excedentes. Calyx brevis strigoso-pubescens calycis lobi lineares. Legumen rectum subcompressum apice mucronatum demum glabrum ± 8-spermis seminibus nigrescentibus.

I. sparsæ Baker var. *bongensi* Baker fil. valde affinis differt caulibus elatioribus foliolis angustioribus.

Hab. East Tropical Africa. Witu, *Thomas* (Gebr. Denhardt), no. 207 !

Belongs to the group of the *Dissitifloreæ*, but is allied to *I. sparsa* Baker var. *bongensis* Baker fil.

A copiously branched annual, ± 40 cm. high. Leaflets 5–8 mm. long, often about 2 mm. broad at the broadest point; strigosely pubescent above, rather more so below. Racemes 1·5–2·7 cm. long (including peduncle). Calyx about 1 mm. long. Legume ± 1·3 cm. long.

(*d*) Leaflets 7, oblanceolate, mucronate, on both sides strigose. Ovary multiovulate. Calyx-lobes long, narrow, glandular.

86. I. patula Baker in Kew Bull. (1897), p. 255.

Hab. British Central Africa. Nyika plateau, at 6000–7000 ft., *Whyte* !

J. T. Last gathered near Blantyre a form of this species.

(*e*) Copiously branching herb. Leaflets 7, oblanceolate. Legume ∞-spermous, densely pilose. Calyx-lobes not glandular.

87. I. Dyeri Britten in Journ. Bot. 1897, p. 453.

I. macra Baker in Kew Bull. (1897), p. 255, non E. Meyer.

Hab. British Central Africa. Between the Songwe River and Karonga, alt. 1700–2000 ft., *Whyte* !

(*f*) Leaflets 7–11, oblanceolate. Legume slightly torulose, 4–8-seeded, cinereo-sericeous, finally glabrescent.

88. I. vicioides Jaubert & Spach, Illus. t. 431 (1853–57); Baker, *l. c.* p. 81 (1871).

I. agowensis Hochst. in Schimper Hb. Abyss. no. 2243; Baker, *l. c.*

I. tenuicaulis Klotzsch in Peters' Mossambique Bot. p. 50 (1862).

Hab. Nile Land. Abyssinia, near Dscha-Dscha, *Schimper*; Hamedo, *Schimper*, no. 410 ! South Central. Highlands of Batoka Country, *Kirk* ! East Tropical Africa. Mozambique, *Peters*.

(*g*) Glabrous. Leaves 3–5-jugate, setaceous. Legume 10–12-seeded.

89. I. asparagoides Taubert in Pl. Ost-Africa, Theil c. p. 210 (1895).

Hab. East Tropical Africa. Bukoba, *Stuhlmann*; Jhangiro, *Stuhlmann*, no. 3353.

(*h*) Subglabrous or strigosely pubescent. Leaflets 13–17, oblanceolate or narrowly oblong. Legume glabrous, subtetragonous, ± 10-seeded.

90. I. multijuga Baker, *l. c.* p. 83 (1871).

Hab. East Tropical Africa. Zambesiland, *Kirk* ! British Central Africa. Nyassaland, *Buchanan* (1891), no. 570 ! no. 791 !

A close ally of *I. dendroides* Jacq.

(*i*) Leaflets 10–15-jugate, oblanceolate or oblong. Legume subglabrous, 10–12-seeded.

91. I. DENDROIDES Jacq. Ic. Pl. Rar. iii. t. 571 (1786–1793); Baker *l. c.* p. 100 (1871); Hiern, *l. c.* p. 216 (1896).

I. palustris Vatke in Oest. Bot. Zeit. xxviii. p. 201 (1878).

Hab. UPPER GUINEA. Senegambia, *Perrottet*! Guinea proper, *Thonning*. *Brass*! *Vogel*! Sierra Leone, *Afzelius*! LOWER GUINEA. Angola, Golungo Alto, *Welwitsch*, no. 2043! EAST TROPICAL AFRICA. Zanzibar, *Hildebrandt*, no. 944! Rabai Hills, *W. E. Taylor*!

Flowers in lax racemes, 8–12 flowers, rather more numerous than is usual in *Dissitifloreæ*.

(To be continued.)

PLANTS OF NORTH PEMBROKE.

By ELEONORA ARMITAGE.

WHEN at St. David's last August, I noticed a number of plants, and on comparing my list with those of Mr. A. G. More and the Rev. W. R. Linton already published in this Journal (Journ. Bot. 1884, 43; 1901, 52), I find there are some to be added. I have not included any already recorded, unless to make some special remark upon them. Mr. Arthur Bennett has seen specimens of most of the plants, and has kindly determined the doubtful ones. As the collecting was only within a small radius of St. David's, I do not note the localities of all.

Ranunculus Drouetii Godr. River Alan.—*Cochlearia officinalis* L. *Silene maritima* L.—*Lychnis Githago* Scop. Growing in several of the fields of barley near St. David's; new County Record.—*Buda rubra* Dum.—*B. rupestris*. Plants of this species were very abundant on the cliffs and on the numerous stone walls near the sea. I noted three distinct forms—(1) stout, stocky growth, scarcely glandular, upright shoots 3 in. long, trailing ones 9 in.; (2) medium size, very glandular, shoots $2\frac{1}{2}$ to $5\frac{1}{2}$ in. long; (3) long, slender luxuriant form, elongated and glandular in all its parts, 10 to $11\frac{1}{2}$ in. high, growing on a steep cliff-face.

Hypericum Androsæmum L. Near Whitchurch.—*H. undulatum* Schousb. Recorded by the Rev. W. R. Linton from places by the sea near St. David's. I found it in fine growth and quantity on the Great Moor about two miles inland, north-east of St. David's.

Linum usitatissimum L. In cultivated fields.

Geranium pratense L. — *Genista pilosa* L. Recorded by Mr. A. G. More from the southern slope of the promontory of St. David's Head. I found it growing in some quantity on the cliffs south of St. David's, between Porth Lisky and Caerfai. — *Ononis repens* L. With white flowers, on a wall on St. David's Head. — *Trifolium medium* L. — *T. arvense* L. In dwarfed growth, on the cliffs near Porth Stinan, 3 to $3\frac{1}{2}$ in. high; among long grass near St. Justinian's Chapel, 8 to $9\frac{1}{2}$ in. high. — *T. filiforme* L. — *Ornithopus perpusillus* L. On Pen Berry.

Myriophyllum alterniflorum DC. River Alan.—*Epilobium*, a peculiar form, which Mr. A. Bennett thinks may be a hybrid, *palustre* × *obscurum*, both these species growing near the same locality. It was a slender unbranched plant, growing in a marshy spot, 9 to 13 in. high, with small oblong-obtuse leaves in pairs, $\frac{5}{8}$ to $\frac{7}{8}$ in. long, stems 1- to 3-flowered.

Smyrnium Olusatrum L.—*Apium nodiflorum* Reichb. f. Besides the type, there were two forms in ditches about St. David's—one with *obtusely* serrate leaves and *yellow* anthers; the other, of more upright growth, with *acutely* serrate leaves, shortly stalked umbels, and *purple* anthers. The latter agrees with var. *ochreatum*, except that the leaves should be bluntly toothed; the var. *repens* being the one with incise-serrate leaves, so that the varietal characters seem to have become mixed.

Valerianella rimosa Bast. A new County Record. This species, with *V. dentata* Poll., occurred frequently in cornfields about St. David's.

Inula Helenium L. Well established clumps in a pasture near the Cathedral.—*I. Conyza* DC.—*Anthemis nobilis* L. Very abundant about St. David's. On the open commons its growth was small and compact, $2\frac{1}{2}$ to 5 in.; among gorse and tussocky grass its lax ascending stems reached 15 in. in length.—*Matricaria inodora* var. *salina* Bab. Near the sea; a very fleshy plant.—*Cichorium Intybus* L.—*Hieracium umbellatum* L. In two forms—one growing in a rough pasture near Porth Stinan, 9 to 12 in. high; the other among the rocks on Carn Llytie, about 4 in. high. Both are referred by the Rev. A. Ley to var. *litorale* Lindeb. or var. *monticola* Jord.

Jasione montana L. Albino.

Calluna Erica DC. In both forms—*glabrata* Seem. and *incana* Auct.—*Erica Tetralix* L.—*E. cinerea* L. Albino; and also one plant on St. David's Head of an exceedingly beautiful colour variation, a brilliant rosy crimson with all the blue tones left out.

Armeria maritima Willd. Albino.

Ligustrum vulgare L.

Myosotis repens G. Don.

Cuscuta Epithymum Murr.

Hyoscyamus niger L. Frequent about the farms.

Veronica scutellata L.—*Euphrasia gracilis* Fr.—*E. nemorosa* Mart.—*Rhinanthus Crista-galli* L. var. *angustifolia*. Among gorse on a common near Whitesand Bay; a fine tall plant with long narrow leaves and large capsules.

Salvia Verbenaca L.—*Scutellaria minor* Huds. In two very different forms on a damp common—compact and short, $2\frac{1}{2}$ to 3 in., on a raised bank; slender and elongated among rushes, 13 to $15\frac{1}{2}$ in.—*Stachys Betonica* Benth. With flesh-coloured and with white flowers; also a fine rich crimson-coloured variety on the cliffs, very hairy, of stout, vigorous though low growth, 4 to $6\frac{1}{2}$ in. high.

Plantago maritima L. and *P. Coronopus* L.

Euphorbia exigua L.

Scilla verna Huds. The seed-vessels of this plant were very conspicuous, scattered thickly all over the cliffs along the coast, from Solva to St. David's Head, and to the rocky top of Carn Llytie.

Potamogeton varians Morong. In a brook on the Great Moor. Mr. Arthur Bennett sends me the following note on this plant :— "The *Potamogeton* proves, on examination, to be of much interest, and to agree with Mr. Fryer's specimens of *P. varians* Morong ex Fryer in *Journal of Botany*, 1889, p. 33, t. 287 = *P. spathæformis* Tuck. ex Robbins in Gray's Man. Bot. N. U. S. ed. 5, p. 487 (1878). It is recorded only from Cambridgeshire in Britain, and Medford, Mass., United States, North America, where it was discovered by Prof. Tuckerman in 1850. 'Mr. Fryer is inclined to regard this species as a hybrid between *heterophyllus* and *angustifolius* [= *Fryii*]. But a weighty argument against this view is the fact that neither of the supposed parents occurs in Mystic Pond, Medford' (Morong, N. Am. Naiadaceæ, p. 27, 1893)."

Carex pulicaris L.—*C. Goodenowi* J. Gay.—*C. flacca* Schreb.—*C. binervis* Sm.—*C. Œderi* Retz.

Phalaris arundinacea L. Viviparous.

Arrhenatherum avenaceum var. *nodosum* Reichb. — *Sieglingia decumbens* Bernh.—*Molinia varia* Schrank.

Asplenium Adiantum-nigrum var. *obtusum* Kit. & Milde. A well-marked plant, growing in walls about St. David's.—*A. marinum* L. In sea-caves and in clefts of rocks on St. David's Head.—*Equisetum limosum* var. *fluviatile* L. Great Moor.

WEISIA STERILIS, SP. N.

By W. E. Nicholson.

For some time past I have been greatly puzzled by a small species of *Weisia* belonging to the *Systegium* group, which I have met with in various parts of the chalk downs in Sussex, and which was sent to me in a sterile state from Folkestone by Mr. H. N. Dixon. The plant is rather tall and lax in habit, with the ordinary leaves abundantly produced and not differing in such a marked way from the perichætial leaves, as is the case with the other members of this group. From the plane margined leaves and the fact that several perichætia are not infrequently found on the same stem, I was inclined to refer the form to *W. multicapsularis* Mitt., and it was not until the discovery of the true *W. multicapsularis* in December, 1901, that I became aware of my mistake. Unlike the other members of this group, the plant in question is more frequently sterile than not, and in this condition, especially in a dry state, it might readily be passed over as a form of *W. tortilis* C. M., which frequently grows in the same habitat. Though frequently growing intermixed with typical *W. crispa* Mitt., the present plant appears to be very constant in its characters, and I

have never met with an intermediate form. I propose therefore to describe the plant as a new species of *Weisia*, under the name of *W. sterilis*.

Weisia sterilis, sp. nov. Monoicous. Male flowers gemmiform close by the perichætium. Tufts larger and much looser than those of *W. crispa*, often very loosely adhering to the substratum, yellowish green. Stems branched, rarely simple, to 2·3 cm. high. Leaves small in the lower parts of the stem, increasing in size towards the apex, where they are often 3 mm. long, rather narrow, from about ·65 mm. broad at the base to ·25 in the middle of the leaf; margins flat, or rarely very slightly incurved, strongly crisped when dry. Cells pellucid, roundish quadrate, above ·008 to ·010 mm. wide, less papillose than in *W. crispa*, incrassate, basal cells somewhat elongate. Nerve stout, about ·09 at the base, generally smooth at the back, excurrent in a short point. Perichætial leaves 3 to 4 mm., and except in the sheathing hyaline base, composed of thinner-walled cells, not very different from the ordinary leaves. Seta about ·45 mm. long. Capsule nearly spherical, about ·8 mm. long, with the operculum, which is about ·35 long, indistinctly defined, sharply rostrate. Cells of the exothecium thin-walled, scarcely differentiated at the indistinct operculum, mostly rectangular, and about ·045 broad in the middle of the capsule. Spores ·016 to ·018 mm., pale brown, papillose; mature in February.

On dry sunny slopes and stony broken ground on the chalk downs from Lewes to Chichester (*W. E. N.*), Reigate (*W. E. N.*), Folkestone (*H. N. Dixon*).

W. sterilis differs from *W. Levieri* (Limpr.) Kind., to which Dr. Hagen was at first inclined to refer it, in the narrower yellowish leaves with pellucid cells and the less highly developed operculum; and from *W. crispa* var. *aciculata* (Mitt.) Braithw. in the more numerous narrower leaves, which are less distinct from the perichætial bracts, and in the longer beak to the operculum. *W. Mittenii* is distinguished at once by its fragile, less crisped leaves, and the capsule on a longer seta, and with a more highly developed operculum. *W. multicapsularis* has fewer, shorter leaves, with a more obscure areolation, and less crisped when dry. The perichætial leaves are more strongly differentiated, and the spores are larger. The three last forms are generally found on siliceous soils, while *W. sterilis* is distinctly a plant of a calcareous habitat.

If the principle of subspecies be admitted, *W. sterilis* should perhaps be regarded as a subspecies of *W. crispa*, which may be considered the type of the *Systegium* group; but, if so, then *W. Mittenii*, *W. multicapsularis*, and *W. Levieri* should also be reduced to the same rank.

SHORT NOTES.

Damasonium stellatum in Leicestershire. — No mention is made of this species in the *Flora of Leicestershire*, published in 1886, and I was unaware until recently that it had been recorded as a Leicestershire plant. A short time since, while examining the Bloxam MS. and catalogues deposited at the Leicester Museum some years ago, I came across a list of species found in various parts of the county by the Rev. A. Bloxam, who notes that *Actinocarpus Damasonium* occurs among reeds at Groby Pool. The date of the catalogue is uncertain, but it is probably about 1828. There is no record of the plant having been found at Groby since Mr. Bloxam's time, although the pool and its surroundings have been thoroughly explored by subsequent generations of botanists. In this Journal (1903, p. 56) Mr. Bennett points out that this is a decreasing species in England, and the editor in a footnote adds that it is of uncertain occurrence. This last remark leads one to hope that the plants may yet be re-discovered at Groby, as there seems no reason to doubt that it was found there. I ought to add, however, that the pool has been considerably reduced in area, owing to the growth of reeds, and it is not unlikely that the *Damasonium* may have become extinct on this account. In the herbarium of the late Miss Mary Kirby, which contained many Leicestershire plants, there is a specimen of the *Damasonium* apparently of Mr. Bloxam's collecting, but, unfortunately, this is unlocalized. The species, so far as I can gather, does not seem to have been noted in any of the counties bordering Leicestershire.—A. B. Jackson.

"Ranunculus bulbosus sulphureus." — Under this name a pretty form of *Ranunculus bulbosus* with very pale yellow—hardly more than cream-coloured—flowers was exhibited as "new" at the recent show of the Royal Horticultural Society in the Temple Gardens. It may be worth noting that exactly the same plant occurred by the catacombs in the Brompton Cemetery in 1860-63, as recorded in the *Phytologist* n. s., vi. 592. There was a small patch of about three or four plants which I visited regularly for the four years indicated.—James Britten.

Hieracium surrejanum F. J. Hanb. var. megalodon Linton.— A hawkweed (no. 2687) which I found growing, last summer, on clay-banks near Fittleworth Station, v.-c. 13 W. Sussex, has been named as above by Rev. E. F. Linton; I believe that I also saw it in plenty on the sides of the sandy cutting west of, and close to, Petworth Station. To this variety I refer my no. 2130, from sandy banks about Fleet, v.-c. 12 N. Hants (June 17, 1898), and no. 2131, from sandy railway-banks between Brookwood and North Camp, v.-c. 17 Surrey (June 15, 1898): they were named *H. sciaphilum* Uechtr. by Mr. Hanbury, but differ much from that species in foliage, in the clothing of the heads, and especially in having the ligules quite glabrous-tipped. My original opinion was that they

came nearest to *H. surrejanum*, and this now proves to have been correct.—Edward S. Marshall.

Fertilization and Spore-ripening in Mosses.—A. Grimme (in *Hedwigia* xlii. pp. 1–75) has investigated carefully the exact time when fertilization occurs in 207 species of mosses growing in Thuringia and Lower Hesse, and the subsequent period that elapses till the spores are ripe. All previous records, save those of Arnell for Scandinavian species, he finds to be untrustworthy. The characters that betoken maturity in the antheridia and archegonia are indicated. As the archegonia persist for a much shorter period than the antheridia, a monoicous inflorescence may appear to be unisexual. Dichogamy may prevent self-fertilization; but the author does not believe that cross-fertilization is of any real advantage to mosses. Sterility is mainly due to the inadequacy of a dioicous inflorescence in dry weather. Antherozoids are distributed by creeping insects, &c., or by the splash of rain-drops. As to spore-ripeness, the ordinary records are useless and misleading; it varies with the climate. The signs of spore-maturity are pointed out. The detaching of the operculum in herbarium specimens is no satisfactory guide as to the natural time of ripeness. The author supplies a table in which are arranged, in parallel columns, the exact seasons of fertilization and of spore-ripening, and the length of the intervening period during which the sporogonium is developing, that is, of course, in the district in which the author's observations were made; and for the sake of comparison the corresponding results obtained by Arnell in Scandinavia are added, and also the times of spore-ripeness as recorded by Limpricht. The period of inflorescence is short and definite for each given species, usually one to two weeks. In more than half the species examined the period of sporogonial development is longer in Germany than in Scandinavia; in the case of *Grimmia ovata* it is as long as twenty-four months; in *Catharinea tenella* it is only four months. In the majority of German mosses it approaches two years. Self-fertilization is the rule in the hermaphrodite species; the antheridia and archegonia are mature at the same time, and thus tend to make cross-fertilization impossible. The author is doubtless justified in the belief that his observations will be of great help, not only to bryologists, but also to teachers of botany who may require to know the exact time when to hunt for fresh specimens bearing ripe spores, or exhibiting the process of fertilization, a stage which is of such limited duration, owing to the short life of the archegonia. Antheridia may often be found at other seasons.—A. Gepp.

NOTICES OF BOOKS.

The Forest Flora of New South Wales. Parts i. & ii. 4to. Feb., March, 1903. Price 1s. each. — *A Critical Revision of the Genus Eucalyptus.* Part i. 4to. 4 plates. Price 2s. 6d. By J. H. Maiden. Published by the authority of the Government of New South Wales: Sydney, Gullick.

We have here the first instalments of what should prove two very useful works. Mr. Maiden has for many years devoted himself to the study of the Australian forest-flora, and more especially to its most characteristic genus *Eucalyptus*; no man living has better opportunities of becoming acquainted with the subjects of the works in a living state, and we are justified in looking to him for what should be a standard work on a large and difficult genus.

The *Forest Flora* follows no particular order; each number contains four good-sized and fairly well-drawn figures with accompanying letterpress: it is hoped to issue about eight parts annually; the price (a shilling for each or ten shillings for twelve) is very reasonable, and the Forest Department of New South Wales is to be congratulated on its enterprise. It is, we think, to be regretted that the text and plates are not so printed that they can be separated when the volume is complete and bound in systematic order. There is a certain want of recognition of various small matters which in the aggregate contribute very considerably to the usefulness and usableness of a book; for example, the name of the plant under consideration should, in books like this, appear at the head of each page.

Useful, however, as the *Forest Flora* is likely to be, it is disappointing to find that Mr. Maiden has contented himself with reprinting Bentham's descriptions from the *Flora Australiensis*, instead of describing the species anew from the living material at his disposal. Moreover, a great deal of unnecessary matter is printed, *e.g.* under *Syncarpia laurifolia* we have a dissertation on the distinction between *Syncarpia* and *Metrosideros*, which seems out of place in such a work, and a long reprint of a report on its timber which occupies 6½ pages of small print, and might with advantage have been epitomized. There is indeed both in the *Forest Flora* and in the *Eucalyptus* monograph considerable extravagance in typography; the descriptive portion would be improved by condensation, and by a little more attention to literary form and method. It is somewhat disconcerting, for instance, to find no comprehensive botanical description of *Eucalyptus pilularis*—the only species in this instalment of the monograph; Smith's brief original diagnosis is given, with a note that the tree is "more amply defined" in Bentham's *Flora* and in Mueller's *Eucalyptographia*. The introductory matter seems to lack arrangement: we have first "Variation in the Genus," then "Doubtful Species," which would have come better when the volume is completed; then "Non-Eucalypts described as Eucalypts," followed by "Works consulted"—a list which, from a bibliographical standpoint, leaves much to be desired. Under this head we find a somewhat remark-

able suggestion: "There can be no doubt that the time has arrived when a process akin to the consolidation of legal statutes is desirable as regards the National Genus of Australian Plants. The literature is very scattered, and so are the types; a few I have not been able to see, and do not even know where they are." Every monographer will sympathize with Mr. Maiden in his difficulties; but does he intend to suggest that the Eucalypti from the herbaria of the world should be "consolidated" at Sydney?

It was with some astonishment that we read: "Most of the original descriptions of Robert Brown remain in manuscript, while later work has rendered some of them of only historical value. I do not hesitate to say that the suppression of these descriptions has been a heavy blow to British botanical science, whether this suppression eventually met with the acquiescence of Robert Brown himself, or whether he was controlled, in this respect, by superior authority." By the use of the word "suppression" the writer seems to imply that Brown was in some way prevented from publishing his work. Mr. Maiden would have done well to have consulted Brown's successors before printing so misleading a sentence. Mr. Carruthers informs us that he gathered from Mr. J. J. Bennett, Brown's friend and successor, that Brown was much annoyed at some criticisms which were passed in some Review (probably the 'Monthly,' or perhaps the 'Edinburgh') upon the Latinity of the published portion of the *Prodromus*, and that he took these so much to heart that he would not complete the publication of the book. Be that as it may, there is absolutely no foundation for Mr. Maiden's suggestion that Brown "was controlled in this respect by superior authority"; nor is it easy to guess what "authority" he would have recognized as superior to his own in the matter.

As a matter of fact, botanists a century ago were content to work without being anxious to record in print the results of their investigations until these had been fully matured. The amount of unpublished matter by Solander, Dryander, Brown, and others, now preserved in the National Herbarium, is remarkable, and testifies to their unflagging industry; it may be regretted that more of their work was not published, but it must be admitted that at the present day a little more reserve would add to the value of publications, though it might lessen their number.

We shall look with interest for the continuations of Mr. Maiden's works, the value of which is greatly enhanced by their useful plates.

Kryptogamenflora der Mark Brandenburg. iv Heft. i. *Characeen.* By L. Holtz. 8vo, pp. vi, 136. With woodcuts. Leipzig. 1903. Price 5s.

This somewhat elaborate work is divided into two parts, comprising fourteen sections. The first part (pp. 1–48) is devoted to the structure, distribution, and characteristics of the *Characeæ* generally, and the second to the species occurring in the province. The account of the structure (sect. 1–3) is illustrated by a number of figures after Migula; in sect. 4 are enumerated the principal works on the order; and sect. 5–7 relate to the position, sub-

divisions, and distribution of the group, the author following Dr. Migula in placing *Lychnothamnus stelliger* Braun in a separate genus, *Tolypellopsis*. In sect. 5 there is a useful table of the directions of variation in the different organs. Sect. 8 contains a key to the European species. The second part commences with sect. 9, which deals with the habitats within the province; sect. 10 with the records followed by a list of collectors. In sect. 11 we come to the descriptions and localities of the species found in the province, about half of which are figured, but without magnifications. Twenty-seven species are enumerated, *C. rudis* being treated as a separate species, and *C. delicatula* numbered as such, though referred to as a subspecies of *C. fragilis*. Five of the species—*Nitella syncarpa*, *Lychnothamnus barbatus*, *Chara scoparia*, *C. jubata*, and *C. tenuispina*—do not occur in this country, while eight of the British species are wanting from the province. We are glad to see that the author has not followed Dr. Migula in giving lengthy descriptions of multitudinous forms, but has adopted Braun's method in indicating the directions of variation. Neither the descriptions nor the figures are very satisfactory. The last section contains practical directions for collecting and preserving.

H. & J. G.

BOOK-NOTES, NEWS, &c.

We take the following from the Report of the Acting Director (Mr. J. B. Carruthers) of the Ceylon Botanic Gardens for 1902:—"The retirement of William de Alwis Seneviratne, Mudaliyar, Draughtsman, after a service of thirty-six years, calls for special mention and recognition of his exceptional services in the Department. His skill as a scientific artist is known in Europe as well as in Ceylon. During his term of office he made a very large series of botanical drawings of Ceylon plants, ranging from flowering plants to fungi. The majority of the drawings illustrating Dr. Trimen's *Flora of Ceylon* were his work, and he was also the author of a beautiful series of drawings in Moore's *Lepidoptera of Ceylon*. The extensive and critical knowledge of the plants of Ceylon possessed by Mr. Alwis enabled him to be of the greatest value to the Department, and Drs. Thwaites and Trimen and the present Director have each recorded their regard for him and appreciation of his work. Mr. Alwis combined with his skill and knowledge a most courteous manner, and his resignation will be noted with regret by a large number of visitors, both resident in the Island and from foreign countries, who have worked in the Herbarium and availed themselves of his help in identifying plants. His Excellency the Governor, in recognition of Mr. de Alwis's services, conferred upon him in 1896 the honorary native rank of Muhandiram, and later, in 1901, the still higher rank of Mudaliyar. It is a matter for satisfaction that Mr. Alwis continues to reside at Peradeniya and frequently visits the Herbarium. He was succeeded by his son, Mr. A. de Alwis, he being the third generation of his family to carry on this important work."

The fourth volume of M. Eugène Rolland's *Flore Populaire* continues the work on the lines described in previous notices (see Journ. Bot. 1897, 365; 1900, 197; 1901, 146), with the important restriction that in this and in future volumes, "Nous ne nous occuperons plus que des pays de langue gallo-romane." This seems to us a wise limitation, which we could wish had been adopted from the beginning of the work. The present instalment is mainly occupied with the *Leguminosæ;* the walnut, to which forty-four pages are devoted, follows the *Rhamnaceæ*. The exhaustive character of the undertaking is well maintained.

Messrs. Duckworth have brought out a second edition of Mr. Massee's *Text-book of Plant Diseases* (price 5s. net). It is apparently unaltered from the first edition, which was reviewed in this Journal on its appearance in 1899, except by the (p. 362) addition of an appendix of thirteen pages, dealing with "several very destructive diseases [which] have either appeared for the first time or have developed and extended to an alarming extent during the interval" since the first edition was published. The text being thus unaltered, there is nothing more to say about it, except to suggest that in any future issue some of the suggestions made in the review referred to by Mr. Worthington Smith—himself no mean authority on the subject—should receive the consideration to which they seem entitled.

The third part of Dr. Theodore Cooke's *Flora of the Presidency of Bombay* brings the enumeration down to the end of *Rubiaceæ*, and completes the first volume. We see that the trivial name *corymbosa* is retained for the species of *Knoxia* to which *stricta* was applied nine years earlier by Gærtner; the note on to this in the *Botany of Cook's Voyage* (p. 48) may be transcribed here: "Specimens in the Banksian Herbarium, identified by Dryander with Gærtner's figure and description, leave no doubt as to the correctness of Willdenow's suggestion that his *corymbosa* is identical with Gærtner's *stricta*. Gærtner's analysis was made 'ex herbario Banksiano,' probably from the specimens in question."

Messrs. Methuen announce for publication an exact reprint of Parkinson's *Paradisus Terrestris*. A thousand copies will be printed; the published price will be 30s. net. The *Paradisus* is a delightful book, whether viewed from the standpoint of horticulture or literature, and we imagine there will be no difficulty in disposing of the copies.

At the meeting of the Linnean Society on the 4th June, 1903, Mr. R. Morton Middleton exhibited a holograph letter from Linnæus to Philip Miller, dated Upsala, 3 August, 1763, and read a translation of the same. Mr. F. N. Williams showed a series of 100 drawings of British *Compositæ*, 20 being *Hieracia*, drawn in pen-and-ink by Mr. E. W. Hunnybun, of Huntingdon, an accomplished artist and British field-botanist. Mr. George Massee showed a remarkable felted lining of fungus-mycelium of a *Polyporus* taken from the interior of the node of a bamboo. Mr. Percy Groom read a paper entitled "Notes on the Transition of Opposite Leaves into the Alternate Arrangement: a new factor in morphologic

observation." The author stated that his observations began on *Atriplex rosea*, and, to make a graphic representation of results, he plotted the length of the internodes in a given manner, which produced a regular curve: when this principle was applied to *Chenopodium* and *Salsola* an entirely different result came out, and a zigzag course was plotted, due to the long and short internodes alternating. His belief was that this was due to the fusion of branch and stem, for axillary branches are given off, but without visible traces of the fusion which does exist; in *Salicornia*, for instance, the leaves are fused up to the next node above. Continuing his observations, the author examined *Scrophularia nodosa*, which showed leaves opposite at the bottom, while the inflorescence was alternate; *Symphytum* showed the same, but *Rhinanthus Crista-Galli* presented a curious anomaly: the leaves were commonly opposite, but sometimes the tip showed a cleft, becoming distinctly bilobed, and then, by displacement, passing into the alternate arrangement. *Lysimachia vulgaris* first showed opposite leaves, then, by the process last described, splitting at the apex and becoming distinct, a whorl of four leaves finally appeared. The author laid stress on the fact that he had taken his examples at random. Although this was only a preliminary statement of the facts observed, it embodied a long series of observations.

At the meeting on the 18th June, 1903, Mr. C. B. Clarke showed specimens of a variety of the primrose, *Primula vulgaris* Huds., with remarkably small flowers, to which he proposed to give a varietal name. A paper by Mr. S. T. Dunn, on "New Chinese Plants," was, in his absence, read by Mr. C. H. Wright. In this, descriptions of over seventy new species are given, founded on specimens collected chiefly in Yunnan by Dr. A. Henry and Mr. E. H. Wilson; amongst them are a *Magnolia* and a *Bombax*, each of which was seen on one occasion only, and then as a solitary tree. A detailed account is given of the synonymy of the nine species of *Cryptotæniopsis* Dunn, a genus of Umbelliferæ, in which the secondary branches of the inflorescence are cymose, not umbellate, as is usually the case in the order. Eleven new species of *Senecio* are described, bringing the total now known from China up to 129. They are remarkable for the diversity in habit which they present; one has radical leaves much resembling those of the common ivy, and in another each capitulum bears a solitary flower. Two species of *Æschynanthus* are described by Mr. W. B. Hemsley, one of which adds a second species to the section *Microtrichium* distinguished by the short solitary hair at each end of the seed. A new genus of Cyrtandraceæ—*Rhabdothamnopsis* Hemsl.—is described; it is allied to *Streptocarpus*, but has the shrubby habit of the New Zealand *Rhodothamnus Solandri* A. Cunn. Mr. Wright also read a short paper by Mr. W. B. Hemsley, on the germination of the seeds of *Davidia involucrata*. The fruit has an exceedingly hard, bony endocarp, enclosing usually a number of seeds. Under the influence of moisture, a portion of the back of each cell (carpel) separates and falls away in the form of a valve or shutter, revealing a portion of the seed. The radicle soon begins to grow, and in time reaches

the ground, when the upper part of the plantlet frees itself and commences an independent existence. A paper on "Scottish Freshwater Plankton," by W. and G. S. West, was read for the authors by Dr. F. E. Fritsch. Little has hitherto been done to put on record the phytoplankton of the freshwaters of these islands. Borge, in 1897, published a list of Mull plankton, and Dr. Fritsch has quite recently issued a preliminary report on that of the Thames. The present paper deals with plankton-material from lochs in different parts of Scotland and the Outer Hebrides. The Scottish plankton is found to differ considerably from that of the western part of continental Europe; it is remarkably rich in Desmids, which are of a distinctly western type, and the most abundant are species of *Staurastrum*. The scarcity of free-swimming Protococcoideæ is striking, but Diatoms are fairly represented. A noteworthy feature is that both Diatoms and Desmids display long spines or processes; this excessive development is ascribed by the authors to the assumption of a purely free-swimming habit. Dr. Fritsch added his opinion that the assumed scarcity of Protococcoideæ was due to the small percentage of organic material present. A paper by L. Lewton-Brain, "On the Anatomy of the Leaves of British Grasses," was read in abstract. The author alluded to the work on this point by Duval-Jouve, Guntz, Schwendener, Pée-Laby, and Raunkier. The present paper is the result of testing the classification of leaf-structure devised by Prof. Marshall Ward. Four main types are recognized:—(1) Leaves in which the upper surface is flat or nearly so; (2) the upper surface marked by distinct though very high ribs; (3) the upper surface marked by very distinct and high ribs; and (4) the upper surface reduced to a mere fold in an almost solid leaf. Observations are recorded on the epidermis, vascular bundles, bundle-sheaths, mechanical tissues, and chlorophyll-containing tissue. Then follow descriptions of the grasses examined, classified according to the characters presented, as noted above, and the paper closes with a consideration of the structure as influenced by environment.

We have received a circular signed by Professors Ascherson, Engler, Schumann, and other botanists associated with the Berlin Botanical Museum as the Committee, of a new botanical society. The Society is to consist of those interested in Systematic Botany and Plant Geography. A yearly subscription of 3 marks is suggested. This would give the right of taking part in the meetings and of receiving the "Proceedings." The latter will be published in Engler's *Jahrbuch*, and separate copies will be sent to members of the Society. As places of meeting will be selected university towns of Central Europe or towns which contain large botanical collections, and give opportunity for interesting botanical excursions. Special stress will be laid at the meetings on demonstrations and the illustration of recent interesting botanical expeditions by photographs. The first meeting will take place at Berlin from September 17 to 20, when the next meeting-place will be decided upon. Prof. K. Schumann will be glad to receive names of intending members and any suggestions.

A.L. Smith del.
P. Highley lith.

West, Newman imp

New or Critical Microfungi.

NEW OR CRITICAL MICROFUNGI.

By Annie Lorrain Smith.

(Plate 454.)

Ctenomyces Eidam in Cohn's Beitr. z. Biol. iii. (1880), p. 274.

Ascophore brightly coloured, the peridium formed of loosely interwoven, septate, torulose hyphæ, and round the circumference a series of projecting delicate spiral filaments; asci small, spherical, 8-spored, borne on internal hyphæ; spores minute; conidia on branched conidiophores.

C. serratus Eidam. Ascophore forming a small, round, yellowish ball ½–1½ mm. in diameter, the hyphæ of the peridium composed of short indented torulose cells; asci of a deep yellow colour in the mass, crowded in the centre, about 4–5 μ in diameter; spores cylindrical, yellow in the mass, about 2 $\mu \times 1$ μ; conidia oval, colourless, 1–2-celled, 5–6 $\mu \times 2$–3 μ. Resting hyphæ also formed, of comb-like structure, the individual cells growing out into a curved tooth on one side of the filaments. (Pl. 454, figs. 1 and 2.)

On old feathers. On decaying beech and other leaves in Hampshire.

This fungus was found by Eidam in Silesia in 1880. There is no further record of its occurrence anywhere until it was collected in the spring of this year by the Rev. W. L. W. Eyre at Alresford, Hampshire.

When Eidam first saw the fungus, the hyphæ were in the resting stage of the comb-like structure. He kept it moist on the decaying feather where it had first appeared, and the next stage to be produced was the white fluffy mass of conidia-bearing hyphæ. Later appeared the yellow ascophores. He was able to watch the development of these, and he describes the formation of the antheridial branch, a club-shaped cell round which the ascogenous hypha, which arose from the base or from a neighbouring filament, wound itself in a close spiral, and finally branched into the fertile ascus-bearing hyphæ. The peridium was formed subsequently by branches from the base of the ascogonium.

The fungus is closely allied to *Gymnoascus* and *Myxotrichum*. It has the specialized projecting hyphæ of the latter, but it is altogether more delicate in structure. The form of the peridium and the bright colour place it nearer to *Gymnoascus*.

Valsa heteracantha Sacc. Myc. Venet. Spec. p. 129, t. xiv. figs. 35–42. Stroma broadly effused, seated in the cortex and at first covered by the periderm, deep black; perithecia immersed, scattered or occurring in groups, globose, ¾–1 mm. in diameter, with stout cylindrical or almost cone-shaped, smooth ostioles, which burst through the periderm in groups, diverging and elongating irregularly, the base surrounded by thorn-like hyphæ, which disappear later; asci broadly clavate, long-stalked, 18–25 μ (p. sp.) ×

$4\frac{1}{2}$ μ, 8-spored; spores in two rows or irregularly massed in the ascus, cylindrical, bent, yellowish, 5–6 μ × $\frac{3}{4}$–$1\frac{1}{4}$ μ.

On branches of various trees.

Collected by Mrs. Montague in Devonshire, April, 1903. The species is said to be common in southern Europe. The hyphæ at the base of the ostioles had disappeared in the Devonshire specimen.

Ampullaria, gen. nov.

Perithecia growing singly, bright-coloured, globose with a long ostiole, formed of delicate cells; spores ovate, dark-coloured when mature.

A. aurea, sp. unica. Perithecium semi-immersed or superficial, globose, up to 170 μ in diameter, the outer wall about 20 μ thick of two or three layers of cells, transparent and showing the dense mass of spores crowding the interior and lying at all angles; neck about $\frac{1}{4}$ mm. long, ending in a spreading pencil of pointed hyphæ; spores ovate, pointed at both ends, colourless then dark-grey-coloured or almost black, 18 × 12 μ, escaping singly through the long neck and gathering in a ball at the opening. (Pl. 454, figs. 3–5.)

On dead clover seeds, Norwood.

The fungus not only grew on the clover seeds, but several grew on the dish on which the seeds were being tested for germination, long colourless hyphæ connecting the different individuals.

The fungus corresponds with *Sphæronemella* among the hyaline-spored *Nectrioidaceæ*. The only genus under *Nectrioidaceæ-Zythieæ-Phæosporæ*, following Lindau's arrangement, is *Martinella*, which forms a stroma. *Ampullaria*, with its simple perithecium stands so far by itself. It is probably the pycnidial form of one of the *Hypocreaceæ*. The name was suggested by its resemblance to a flask.

Brachycladium Corda, Ic. ii. p. 14.

Fertile tufts erect, simple below, branched above, transversely septate, branches and branchlets forming heads of conidia at the tips; conidia pluri-septate, dark-coloured, non-catenulate.

B. botryoides, sp. nov. Sterile hyphæ spreading through the substratum or forming compact stroma-like bodies, from which rise a diverging mass of upright fertile hyphæ; conidiophores flexuous, up to 1 mm. in height, the tips nodulose, bearing a head of conidia, and then branching and forming other heads; conidia borne directly on the nodulose conidiophores, cylindrical, fusoid, slightly bent or straight, blunt at the ends, 2–5-septate, one of the middle cells usually larger than the others, bright brown, up to 45 μ × 10 μ. (Pl. 454, figs. 6–10.)

The basal stroma in section shows a pseudo-parenchymatous mass of brown-walled cells. In artificial cultures the hyphæ readily branch and divide, forming here and there a compact tissue of brown cells.

Found on germinating grass seeds, Norwood, April, 1903.

The genus *Brachycladium* was merged by Fries in *Dendryphium* Wallr., which is distinguished by the branching conidiophores and by the heads of conidia which are borne in chains. Hence in the latter genus a number of forms have been included with non-catenulate conidia, in spite of this being a distinctly generic character. To avoid confusion, it seems advisable to resuscitate *Brachycladium* to include all species with non-catenulate conidia. In addition to the species recorded above, there would be included in Corda's genus: *B. penicillatum* Corda, *B. toruloides* (Fries), *B. ramosum* (Cooke), *B. curtum* (B. & Br.), *B. nodulosum* (Sacc.), *B. laxum* (B. & Br.), *B. curtipes* (Ell. & Barth.), *B. crustaceum* (Ell. & Ev.), *B. pachysporum* (Ell. & Ev.), and *B. macrosporium* (Karst.).

Œdocephalum clavatum, sp. nov. Sterile hyphæ creeping; fertile hyphæ erect, stout, septate, occasionally branching to form a second head near the tip; heads clavate-spherical, varying in size, about 25–30 μ × 20–25 μ, not areolate; spores yellowish, cylindrical, apiculate at the basal end, covered with blunt warts, 14–17 μ × 5–6 μ, rising from points on the head. (Pl. 454, figs. 11, 12.)

This fungus made its appearance at Norwood on a laboratory culture of a bit of hyacinth root in plum-gelatine. The conidiophores are comparatively large and ungainly, and swell out into the slightly clavate head. The spores are very definite and constant in form and size; they differ from those of *Œ. læticolor*, the nearest species, both in size and form, and in the well-marked warts. Spores would scarcely be affected by the culture conditions; the hyphæ and conidiophores might be modified to some extent with a different substratum.

Trichothecium inæquale Mass. & Salm. in Ann. Bot. xvi. (1902), p. 84. This fungus, recently described, grew plentifully in a culture-dish. The size and shape of the spores leave little doubt as to its identification with *T. inæquale*, but the branching at the apex of the conidiophore is more marked in the present specimen, and forms frequently a head of spores, rather suggesting the genus *Cephalothecium*. The same feature reappeared in a gelatine-plate culture of the fungus, but the projections at the tip of the conidiophore were longer and less blunt. (Pl. 454, figs. 13–15.)

On cow-dung.

Haplographium chlorocephalum Grove in Science Gossip, 1885, p. 198. Conidiophores arising singly from the substratum, about ½ mm. in height and 7 μ in width, septate, dark-brown, paler upwards, branched at tip somewhat like *Penicillium*, and bearing chains of olive-brown spores, forming a dense head about 60 μ in diameter; spores globose, clear olive-brown, smooth, about 5 μ in diameter. (Pl. 454, figs. 16–18.)

On leaves of furze, &c., from Torquay, Devonshire, Feb. 1903.

This, the most typical form of the genus, has not hitherto been recorded in this country.

Trichocladium asperum Harz Hyphom. p. 38. On a laboratory culture of a lily root, Norwood. (Pl. 454, fig. 19.)

This fungus has just recently been recorded for this country by Massee and Salmon. They found it growing on rabbit-dung.

DESCRIPTION OF PLATE 454.

Fig. 1. *Ctenomyces serratus*, part of the peridium, × 500. 2. Ascus and spores of same, × 500. 3. *Ampullaria aurea*, whole plant, × 90. 4. Single spore, × 500. 5. Spore germinating, × 500. 6. *Brachycladium botryoides*, plant, × 15. 7. Conidiophore, × 60. 8. Head of coniophore with some spore attached, × 250. 9. Spore, × 500. 10. Conidiophore growing from hyphal tissue in gelatine, × 500. 11. *Œdocephalum clavatum*, conidiophores, × 250. 12. Spore, × 500. 13. *Trichothecium inæquale*, conidiophores, × 250. 14. Spores, × 500. 15. Spore germinating, × 500. 16. *Haplographium chlorocephalum*, conidiophore with head of spores, × 60. 17. Conidiophore, × 250. 18. Head with spores, × 500. 19. *Trichocladium asperum*, hyphæ with spores, × 500.

THE INDIGOFERAS OF TROPICAL AFRICA.

By EDMUND G. BAKER, F.L.S.

(Continued from p. 245.)

Group XIII. STENOPHYLLÆ.—Leaves imparipinnate with generally narrow linear or narrow oblanceolate leaflets. Flowers in short or elongated racemes. Suberect annuals or biennials.*

(*a*) Racemes short, sessile or subsessile. Leaflets 5–9, narrowly oblanceolate.

92. I. PARVIFLORA Heyne in Wall. Cat. 5457; Baker, *l. c.* p. 83.
I. linearis Guill. & Perr. Fl. Seneg. p. 184 (1833).
I. deflexa Hochst. in Kotschy Hb. Nub. no. 14 (1839); A. Rich. Fl. Abyss. i. p. 178 (1847).
I. machærocarpa Fenzl, in Klotzsch Pl. Kord. p. 178 (1837–38).
Indigastrum deflexum Jaub. & Spach. Pl. Or. t. 492 (1853–57).
Hab. UPPER GUINEA. Senegambia, *Perrottet*, no. 196! *Heudelot*. NILE LAND. Nubia and Kordofan, *Kotschy*, no. 14! *Cienkowsky*. Abyssinia, *Schimper*, no. 1467!

(*b*) Racemes (in type) 3–8 cm. long, rather laxly flowered. Leaflets generally 5–7, linear, or linear oblong, but in var. *brachypoda* more numerous, broader, and shorter, and also racemes shorter.

93. I. STENOPHYLLA Guill. & Perr. Fl. Seneg. p. 188, t. 48 (1833); Baker, *l. c.* p. 83.
Hab. Occurs in UPPER GUINEA, NILE LAND, and BRITISH CENTRAL AFRICA.
Var. *brachypoda* Steud. in herb. Schimp. no. 1711.
Hab. NILE LAND. Abyssinia, *Schimper*, no. 1711! *Schimper*, no. 1468! Gallabat, *Schweinfurth*, no. 1816!
Var. *macrocarpa* Guill. & Perr. *l. c.*
Hab. UPPER GUINEA. Senegal, near Albreda.

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* Except *I. Heudelotii* Benth. var. *Elliotii* Bak. fil.

Var. nov. **Nyassæ.** Caulis erectus virgatus angulatus. Folia imparipinnata sæpissime 2-jugata foliolis lineari-oblongis mucronatis nervo medio superne impresso quam iis typi parum latioribus. Racemi quam ei typi apices versus confertiores et flores plures ferentes quam folia longiores. Calyx tubus brevis lobi longi subulares.

Hab. British Central Africa. Nyassaland, *Buchanan*, no. 23 (1896)! Herb. Mus. Brit.

(*c*) Racemes subsessile, lax, about as long as the leaves. Leaflets 19–21, oblanceolate.

94. I. Prieureana Guill. & Perr. Fl. Seneg. p. 187 (1833); Baker, *l. c.* p. 84.

Hab. Upper Guinea. *Heudelot*. *Perrottet*, no. 189!

(*d*) Racemes lax, subsecund, 4–9-flowered. Leaflets 3, linear.

95. I. Welwitschii Baker, *l. c.* p. 84 (1871); Hiern, Welw. Cat. i. p. 209.

Hab. Lower Guinea. Angola, Huilla, *Welwitsch*, nos. 2031, 2032! Pungo Andongo, *Welwitsch*, nos. 2066, 2067!

Has the habit of *Microcharis*.

(*e*) Racemes very long, 20–50-flowered. Leaflets 5–7 oblanceolate.

96. I. psilostachya Welw. in Baker, *l. c.* p. 84 (1871); Hiern, *l. c.* p. 210.

Hab. Lower Guinea. Angola, Prov. Huilla, *Welwitsch*, no. 2052!

(*f*) Racemes lax, 6–12-flowered. Leaflets 7–13, oblanceolate, in var. *Elliotii* leaflets 3–5.

97. I. Heudelotii Benth. ex Baker, *l. c.* p. 85 (1871).

Hab. Upper Guinea. *Garrett*. Senegal, *Heudelot*, no. 611! Sierra Leone *Morson*!

Var. nov. **Elliotii.** Suffrutex ramosus. Caulis lignosus glaber cortice nigrescente. Folia 3–5-foliolata. Foliola oblanceolata vel oblongo-lanceolata sparse strigoso-pubescentia vel fere glabra lateralia parum minora. Racemi breves axillares pauciflori. Legumen rectum subcylindricum glabrum mucronatum, ± 9-spermum.

Hab. Upper Guinea. Sierra Leone, Sherboro, *Scott Elliot*, no. 5341! Samu, *Scott Elliot*, no. 4063!

(*g*) Racemes 2·5–10 cm. long. Leaflets 5–9, sublinear, or narrowly oval-oblong.

98. I. heptaphylla Hiern, Welw. Cat. i. p. 209 (1896).

Hab. Lower Guinea. Loanda, *Welwitsch*, nos. 4145, 4146! Ambaca, *Welwitsch*, 4147, 4148! Pungo Andongo, *Welwitsch*, nos. 4143, 4144!

Closely allied to *I. goniodes* Hochst.

(*h*) Racemes lax, 20–30-flowered, 5–12 cm. long. Leaflets 11–13, oblanceolate.

99. I. goniodes Hochst in Schimp. Hb. Abyss. no. 2242; Baker, *l. c.* p. 85 (1871).

Hab. Nile Land. Abyssinia, near Dscha-dscha, *Schimper*, no. 2242! South Central. Buluwayo, *Dr. Rand*, no 38!

There is a plant approaching the above in Herb. Kew from Delagoa Bay, *L. Scott*, but the leaflets are broader and shorter.

(*i*) Racemes lax, longer than the leaves. Leaflets 13–15, oval-oblong.

100. I. COSTATA Guill. & Perr. Fl. Seneg. p. 187 (1833); Baker, *l. c.* p. 95.

Hab. UPPER GUINEA. Senegambia, *Perrotet*!

Dr. Taubert places *I. trita* L. in this group.

Group XIV. PINNATÆ.—Leaves imparipinnate, in tropical African species, narrow oblong, or oblanceolate, or lanceolate-oblong or acicular, the terminal leaflet sessile or subsessile. Racemes lax.

* Suffruticose. Leaflets oblanceolate, or lanceolate oblong, 3–5 rarely 7, acute or mucronate. Legume straight, glandular, 4–6-seeded.

101. I. HILARIS Eckl. & Zeyh. Enum. p. 241 (1836); Harvey in Fl. Cap. ii. p. 188 (1861–62).

Hab. BRITISH CENTRAL AFRICA. Nyassaland, *Buchanan*, no. 111 (1896)! SOUTH CENTRAL. Mashonaland, Buluwayo, *Dr. Rand*, no. 445!

** Suffruticose. Leaflets (often 5 pairs) narrow oblong.

102. I. HEDYANTHA Eckl. & Zeyh. *l. c.* p. 243 (1836); Harv. *l. c.*

Hab. BRITISH CENTRAL AFRICA. Lower Plateau, N. of Lake Nyassa, *Mr. Thomson*! Kingu Hills, E. of Lake Nyassa, *Rev. W. P. Johnston*!

*** Suffruticose. Leaflets 5–7, cuneate oblong, obtuse. Peduncles glandular.

103. I. HETEROTRICHA DC. Prod. ii. p. 227 (1825); Harv. *l. c.*

Hab. EAST TROPICAL AFRICA. Mozambique District, upper course of River Ninda, affluent of the Zambesi, *Serpa Pinto*, no. 28! HEREROLAND. *Marloth*, no. 1244.

Var. nov. **rhodesiana**. Suffrutex. Rami subherbacei. Folia imparipinnata 2–4-jugata cum impari foliolo quam ea typi majore oblongo vel anguste obovato apice obtuso utrinque strigoso-pubescenti. Stipulæ persistentes. Racemi axillares quam folia longiores. Calycis tubus brevis lobi lanceolato-subulati quam tubus longiores glandulosi.

Hab. SOUTH CENTRAL. Rhodesia, Buluwayo, *Dr. Rand*, no 62!

Branches with spreading hairs and glands, 15–20 cm. long. Rhachis 2–2·5 cm. Leaflets 8–9 mm. long, 3–4 mm. broad. Calyx ± 4 mm. long.

**** Leaves 4–7-jugate. Leaflets acicular, transversely triangular.

104. I. PECHUELII O. Kuntze in Jahrb. Bot. Gart. Berlin, 1886, p. 263.

Hab. HEREROLAND. Tsoachaub River, *Dr. Pechuel-Loesche*.

This is placed here tentatively, as I have not seen specimens. Peduncles 4–6-flowered. Allied to *I. heterotricha* DC. and *I. sordida*. The stem, leaflets, and calyces are covered with glands.

***** Shrub. Leaves 4–6-jugate. Leaflets oblanceolate.

105. I. Goetzei Harms in Engler, Jahrb. xxviii. p. 402 (1900).
Hab. East Tropical Africa. Uhehe, *Goetze*, no. 628.

Group XV. Tinctoriæ. — Leaves imparipinnate, with generally elliptical or obovate leaflets. Flowers in many-flowered racemes. Shrubs or herbs.

(*a*) Herbaceous annuals or biennials, not argenteous.

+ Leaflets 3, often 1 in annual form, roundish. Legume linear, 8–9-seeded.

106. I. medicaginea Welw. ex Baker in Fl. Trop. Afr. ii. p. 86 (1871); Hiern, Welw. Cat. i. p. 210.
Hab. Lower Guinea. Angola, Pungo Andongo, *Welwitsch*, nos. 2025, 2026!

++ Leaflets 3–5, obovate-oblong. Legume deflexed, 3–4-seeded.

107. I. oxalidea Welw. ex Baker, *l. c.* (1871); Hiern, *l. c.*
Hab. Lower Guinea. Angola, Huilla, *Welwitsch*, no. 2023!

(*b*) Stem somewhat shrubby, copiously branched. Leaves subsessile, pinnately trifoliolate. Flowers in axillary racemes of 8–12 flowers. Legumes deflexed, argenteous, 6–9-seeded.

108. I. crotalarioides Baker, *l. c.* p. 85 (1871).
Tephrosia crotalarioides Klotzsch in Peters' Mossamb. Bot. p. 45 (1862).
Hab. East Tropical Africa. Mozambique District. Zambesiland, *Dr. Peters*.
Dr. Schweinfurth (Beitrag. Fl. Æthiop. p. 13) considers *Tephrosia crotalarioides* Klotzsch a synonym of *I. spiniflora* Hochst. et Steud.

(*c*) Stem herbaceous or somewhat fruticose, allies of *I. subulata* Vahl. Leaflets obovate, ovate or elliptical. Legumes deflexed.

* Undershrub. Leaflets 3, obovate. Racemes short, seldom 2·5 cm. long. Legumes deflexed, 6–10-seeded.

109. I. trita Lin. fil. Suppl. p. 335 (1781); DC. Prod. ii. p. 232 (1825); Baker in Hook. Fl. Brit. Ind. ii. p. 96 (1879).
I. hedysaroides Lam. Encycl. iii. p. 250 (1789).
I. cinerea, *I. arcuata*, and *I. rigida* Willd. Sp. Pl. iii. 1225–8 (1800).
Hab. This plant has been frequently recorded for various parts of Africa (*cf.* Fl. Trop. Afr. ii. p. 86; Engler, Pl. Ost Africa, Theil c. p. 210); but the African specimens I have seen differ in having a longer raceme, and I am doubtful whether the true Indian *I. trita* occurs on the continent.

** Herbaceous. Leaflets generally 5–7, oblong elliptical. Racemes long, reaching 1 decm. or more. Legumes deflexed.

110. I. retroflexa Baillon in Bull. Soc. Linn. Par. i. p. 399 (1883).
Hab. British Central Africa. Nyassaland, *Buchanan*, no. 255! (1896). East Tropical Africa. Zanzibar, *Hildebrandt*, no. 943!
Differs from *I. trita* in having generally more numerous leaflets and much longer racemes. Very closely allied to *I. subulata*. The

leaflets are generally 5–7, more rarely 3, oblong elliptical, ± 2 cm. long, ± 1 cm. broad. The type is from Madagascar, *Grandidier*, no. 14, Herb. Mus. Par.

*** Suffruticose. Leaflets pinnately trifoliolate, oblong or narrow obovate. Legumes straight, curved at the ends.

111. I. pseudosubulata, sp. nov. Species *I. tritæ*, *I. subulatæ*, et *I. retroflexæ* affinis. Suffrutex. Ramuli herbacei adscendentes. Folia subsimilia iis *I. subulatæ* pinnatim trifoliolata strigoso-hirta oblonga vel anguste obovata petiolata. Racemi multiflori apicem versus confertiflori inferne magis laxiflori axillares quam folia sæpissime multoties longiores. Pedunculus albo-hirtus. Calyx albo-hirtus calycis lobi angusti quam tubus multoties longiores. "Carina alba alæ rubræ." Legumen rectum ad apicem recurvum hirtum iis *I. tritæ* subsimile sæpissime 6–7-spermum, seminibus pallide brunneis.

Hab. Nile Land. Niamniam Land, Nabambisso, *Schweinfurth*, Ser. ii. no. 77 ! and no. 2994 ! Bongoland, *Schweinfurth*, no. 2703 !

Differs from *I. trita* in its much longer racemes, and from *I. subulata*, and *I. retroflexa* in the much stouter legume. Racemes sometimes 8–10 cm. long, pedicels short. Legume 1·7–2·0 cm. long, patent or deflexed.

**** Suffruticose or subherbaceous. Leaflets 3, obovate or elliptical. Racemes longer than in *I. trita*. Legumes deflexed.

112. I. dimorphophylla Schinz in Verhandl. Bot. Brand. xxx. p. 164 (1888).

I. trita Hiern, Welw. Cat. i. 211, partim, non L.

Hab. Lower Guinea. Angola, *Welwitsch*, nos. 2027–2029 !

The type is from Olukonda and Uvkuambi in Amboland.

***** Annual or biennial. Leaflets generally 3, ovate elliptical. Racemes rather long. Legumes linear, subtetragonous, subulate, 8–10-seeded.

113. I. subulata Vahl in Poir. Encycl. Suppl. 3, p. 150 (1813); DC. Prod. ii. p. 223 (1825); Baker, *l. c.* p. 89.

I. Thonningii Schum. in Schum. Thonn. Pl. Guin. p. 366 (1827).

Hab. Upper Guinea. Guinea, *Thonning*. Senegambia, *Leprieur & Perrottet* ! Nile Land. Uganda, *Scott Elliot*. Lower Guinea. Congo, *Chr. Smith* !

(*d*) An argenteous perennial. Leaflets 3–5, narrow obovate. Legume linear, canescent, 5–6-seeded.

114. I. benguellensis Baker, *l. c.* p. 87 (1871); Hiern, *l. c.* i. p. 211.

Hab. Lower Guinea. Mossamedes, *Welwitsch*, no. 2061 !

(*e*) A copiously branched shrub. Leaflets pinnately trifoliolate, elliptical. Legume linear, densely grey, silky, 3–4-seeded.

115. I. inhambanensis Klotzsch in Peters' Mossamb. Bot. p. 48 (1862); Baker, *l. c.* p. 87.

Hab. East Tropical Africa. Sofala, Inhambane, *Peters*.

(*f*) Argenteous canescent shrub. Leaflets 3–5, obovate oblong. Legume torulose, glaucous, 6–8-seeded.

116. I. OBLONGIFOLIA Forsk. Pl. Aeg.-Arab. p. 137 (1775).

I. paucifolia Delile, Fl. Aegypt. p. 107, t. 37, fig. 22 (1812); Baker, *l. c.* p. 88.

I. erythrantha Hochst. in Schimp. Hb. Abyss. no. 2178.

Hab. Widely spread in Tropical Africa.

Dr. Schweinfurth (Bull. Herb. Boiss. App. ii. 1896, p. 240) describes a var. *carposphigma* from Aden, of which the legume is 6-seeded, and torulose, and the leaves 1–2-foliolate. *I. desmodioides* Baker in Kew Bulletin, 1894, p. 331, from Hadramaut, must be very closely allied to this variety.

(*g*) Suffruticose. Leaflets generally 5, alternate. Racemes many and closely flowered. Legume ± 7-seeded.

117. I. VOLKENSII Taubert in Pl. Ost Africa, Theil c. p. 210 (1895).

Hab. EAST TROPICAL AFRICA. Kilimanjaro, *Volkens*, no. 1738! Madschame, alt. 1000 metres, *Volkens*, no. 1648! Marangu, alt. 11,000 metres, *Volkens*, no. 2124! Nairobi, *A. Blayney Percival*! Dr. Donaldson Smith collected a closely allied plant at Naita.

(*h*) Herbaceous, at the base woody. Leaflets generally 5 (3–7) narrow oblong, generally alternate. Racemes 6–20 cm. long.

118. **I. Phillipsiæ**, sp. nov. Species *I. alternanti* var. *macræ* et *I. Volkensii* affinis. Caules herbacei ad basin lignosi. Folia imparipinnata foliola petiolata apice acuta utrinque strigoso-hirta subtus pallidiora supra costa impressa subtus conspicua foliolis lateralibus quam terminalibus minoribus quam foliolis *I. alternantis* longioribus. Stipulæ lineares persistentes. Racemi longi vel longissimi multiflori apicem versus confertiflori inferne magis laxiflori. Calyx externe griseo-hirtus. Calycis tubus brevissimus lobi lineares quam tubus multoties longiores, petalis subæquilongi. Vexillum externe albo-hirtum. Carina navicularifformis obtusa quam alæ paullo longior. Legumen immaturum griseo-strigosum rectum plurispermum.

Hab. SOMALILAND. Adda Gallah, Darror, *James & Thrupp*! Herb. Kew. Upper Sheik, *Mrs. E. Lort Phillips*. In flower, Jan. 1897, "red flower, very bright." Herb. Mus. Brit.

Stems flavescent or hoary, strigose. Leaflets 3–7, terminal leaflet 2·5–3·5 cm. long, ± 6 mm. broad, lateral leaflets smaller, 1·2–2·0 cm. long. Racemes 6–20 cm. long, longer than the leaves. Calyx 5 mm. long.

(*i*) Annual or biennial herbs, except *I. hirsuta* L. var. *pumila* Welw., which is suffruticose, with soft spreading pubescence. Leaflets 5–11, lateral opposite.

⊙ Legume 6–8-seeded.

119. I. HIRSUTA L. Sp. Pl. p. 751 (1753); Jacq. Icones, t. 569 (1786–93); Baker, *l. c.* p. 88.

I. ferruginea Schum. in Schum. & Thonn. Pl. Guin. p. 370 (1829).

I. fusca G. Don, Gard. Dict. ii. p. 211 (1832).

Hab. Widely spread in Tropical Africa.

Var. *β polystachya* Welw. ex Baker, *l. c.* p. 89; Hiern, Welw. Cat. i. p. 212 (1896).

Hab. Lower Guinea. Angola, Pungo Andongo, *Welwitsch*, no. 2056! Huilla, *Welwitsch*, nos. 2065! 2065*b*!

Var. *pumila* Welw. ex Baker & Hiern, *ll. cc.*

Hab. Lower Guinea. Angola, Huilla, *Welwitsch*, no. 2057!

⊙⊙ Legume 2–4–5-seeded.

120. I. astragalina DC. Prod. ii. p. 228 (1825); Baker, *l. c.* p. 89; Hiern, *l. c.* p. 212.

Hab. Upper Guinea and Nile Land, Lower Guinea. Prov. Bumbo, *Welwitsch*, no. 2021!

(*j*) Suffruticose. Leaflets 5–7 (rarely 3), oblong, lateral opposite. Peduncles much longer than the leaves. Legumes 2–3-seeded.

121. I. longebarbata Engler, Hochgebirgsflora, p. 257 (1892).

Hab. Nile Land. Abyssinia, near Debra Tabor, alt. 2300 metres, *Schimper*, no. 1389! (1863).

(*k*) Prostrate argenteo-canescent herbs. Leaflets obovate or oblong or ovate, generally alternate.

⊙ Leaflets 7–11. Pubescence adpressed, silvery.

122. I. alternans DC. Prod. ii. p. 229 (1825); Baker, *l. c.* p. 89; Hiern, *l. c.* p. 212.

Hab. Lower Guinea. Mossamedes, *Welwitsch*, nos. 2059!, 2058*b*! Hereroland. *Marloth*, no. 1232.

Var. *β macra* Baker and Hiern, *ll. cc.*

Hab. Lower Guinea. Mossamedes, *Welwitsch*, no. 2058!

Var. *γ paucijuga* Schweinf. in Bull. Boiss. 1896, App. ii. p. 239.

Hab. Nile Land. Mt. Erkauit, S.W. from Suakin, *Schweinfurth*, no. 247 (1868).

Dr. Schweinfurth considers *I. parvula* Delile may be synonymous with the last variety.

⊙⊙ Leaflets 3–7. Pubescence cottony, short, spreading.

123. I. maritima Baker, *l. c.* (1871); Hiern, *l. c.*

Hab. Lower Guinea. Angola, Mossamedes, *Welwitsch*, no. 2061*b*! *John Gossweiler*, no. 59!

(*l*) Cano-sericeous, annual. Leaflets generally 5, obovate. Racemes generally 10–14-flowered. Legume short, 2-seeded.

124. I. semitrijuga Forsk. Fl. Aeg.-Arab. p. 137 (1775); Baker, *l. c.* p. 93.

I. Saltiana Steudel, Nom. ed. ii. 1, p. 808 (1840).

I. diffusa R. Br. in Salt. It. Abyss. App. p. 65, nomen.! (1814), non Desv.

I. somalensis Vatke in Oesterr. Bot. Zeit. 1878, p. 201.

Hab. Nile Land. Abyssinia, Howakil Bay, *Salt*! Somaliland. Lasgori, *Hildebrandt*, no. 836*a*.

Var. ? *macrocarpa* Vatke in Oesterr. Bot. Zeit. 1879, p. 221.

Hab. Tropical Africa. N'dara Taita, *Hildebrandt*, no. 2399.

There is a specimen of this plant from Forskahl in Herb. Mus. Brit. The whole plant is covered with a white tomentum, and the legume is terete and 2-seeded. Good specimens were collected by Mr. Lunt on the Hadramaut Expedition, no. 110! and distributed as *I. arabica*.

(*m*) Erect shrubs or suffrutices. Leaflets 5–9, or in *I. Spachii* Baker var. *trifoliolata* Schweinf. 3, lateral opposite.

⊙ Leaflets ± 5 or 3, oval or oblong. Legume 8–10-seeded. Calyx-teeth linear subulate.

125. I. Spachii Baker. *l. c.* p. 92 (1871).

I. coronilloides Jaub. & Spach, Illus. Pl. Or. tt. 485–6 (1853–57), non Mart.

Hab. Nile Land. Mts. of Abyssinia between Melata and Selanke (1853), *Schimper*!

Var. *trifoliolata* Schweinf. in Bull. Boiss. 1896, App. ii. p. 240.

Hab. Nile Land. Eritrea.

⊙⊙ Leaflets 9, oblanceolate oblong. Legume 3–5-seeded, dark, hairy. Calyx-teeth setaceous.

126. I. masukuensis Baker in Kew Bull. 1897, p. 256.

Hab. British Central Africa. Masuku Plateau, alt. 6500–7000 ft., *Whyte*!

⊙⊙⊙ Leaflets 5–7, oblong. Legume 6–10-seeded. Calyx-teeth linear subulate.

127. I. Quartiniana A. Rich. Fl. Abyss. i. p. 183 (1847); Baker in Fl. Trop. Afr. ii. p. 92.

Hab. Nile Land. Abyssinia, *Quartin Dillon*. Oman-Eski, *Schimper* (1854), no. 499. Anadehr, *Schimper* (1862), no. 571!

Dr. Schweinfurth refers this doubtfully to *I. Spachii*.

(To be continued.)

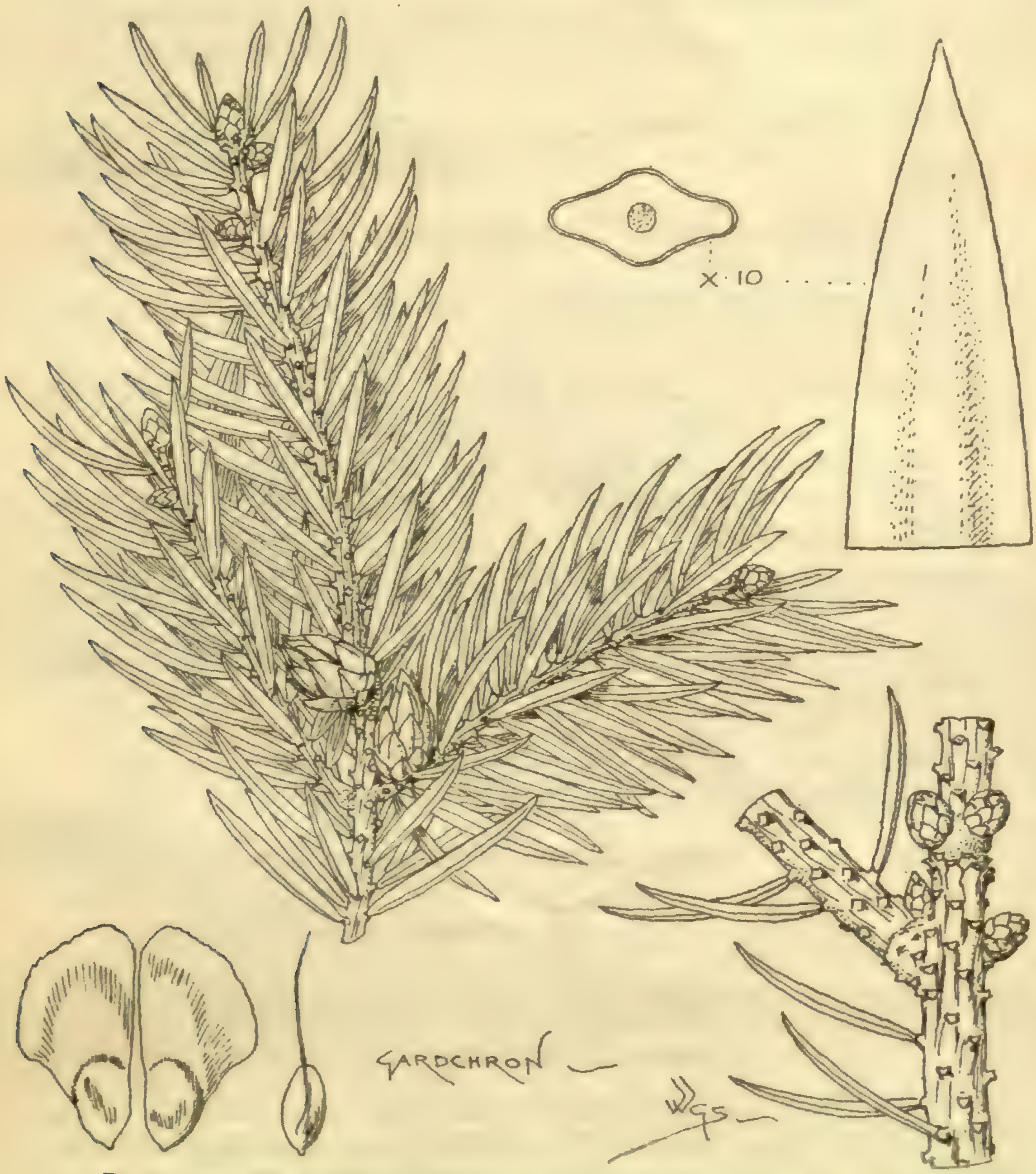
CHINESE CONIFERS COLLECTED BY E. H. WILSON.

By Maxwell T. Masters, M.D., F.R.S.

The following enumeration comprises the names of the Coniferæ collected in various parts of South-Western and of Central China, by Mr. E. H. Wilson, on behalf of Messrs. James Veitch and Sons. Seeds of most of the species were gathered, and the seedling plants are in cultivation in, Messrs. Veitch's nurseries. Mr. Wilson's specimens are excellent, but were mostly collected in the districts previously visited by Dr. Henry, the Abbé David, and others, as enumerated in the "Index Floræ Sinensis" in the *Journal of the Linnean Society*, xxvi. p. 540 (1902). Nevertheless there are a few novelties among them, and as the specimens have been distributed in several of the herbaria of this and other countries, a brief enumeration of the species may be desirable.

Libocedrus macrolepis Benth.; Masters in Gard. Chron. 1901, ii. 467. *Calocedrus macrolepis* Kurz in Journ. Bot. 1873, 193. Szemao, cult., *Wilson*, 76! The specimens from Formosa, in the Kew Herbarium, referred to this species, must be be regarded with doubt, as they are not adequate for determination.

Cupressus funebris Endlicher. West Hupeh, *Wilson*, 335!



PICEA NEOVEITCHII Mast.—Showing shoot with foliage and buds; a portion of a branch, detached; apex of leaf, and plan of leaf-section, magnified ten diameters; seeds natural size.

Juniperus chinensis L. West Hupeh, *Wilson*, 2113! 1701! Also in the Himalayas and Japan.—*J. recurva* Ham., var. *squamata* Parl., *Wilson*, 2113! The species and its variety are found also in the Eastern Himalaya.—*J. rigida* Sieb. et Zucc. West Hupeh, *Wilson*, 370! A native also of the mountains of Japan.—*J. taxifolia* Hook. & Arn. Szechuen, *Wilson*, 428! W. Hupeh, 479! Japan.

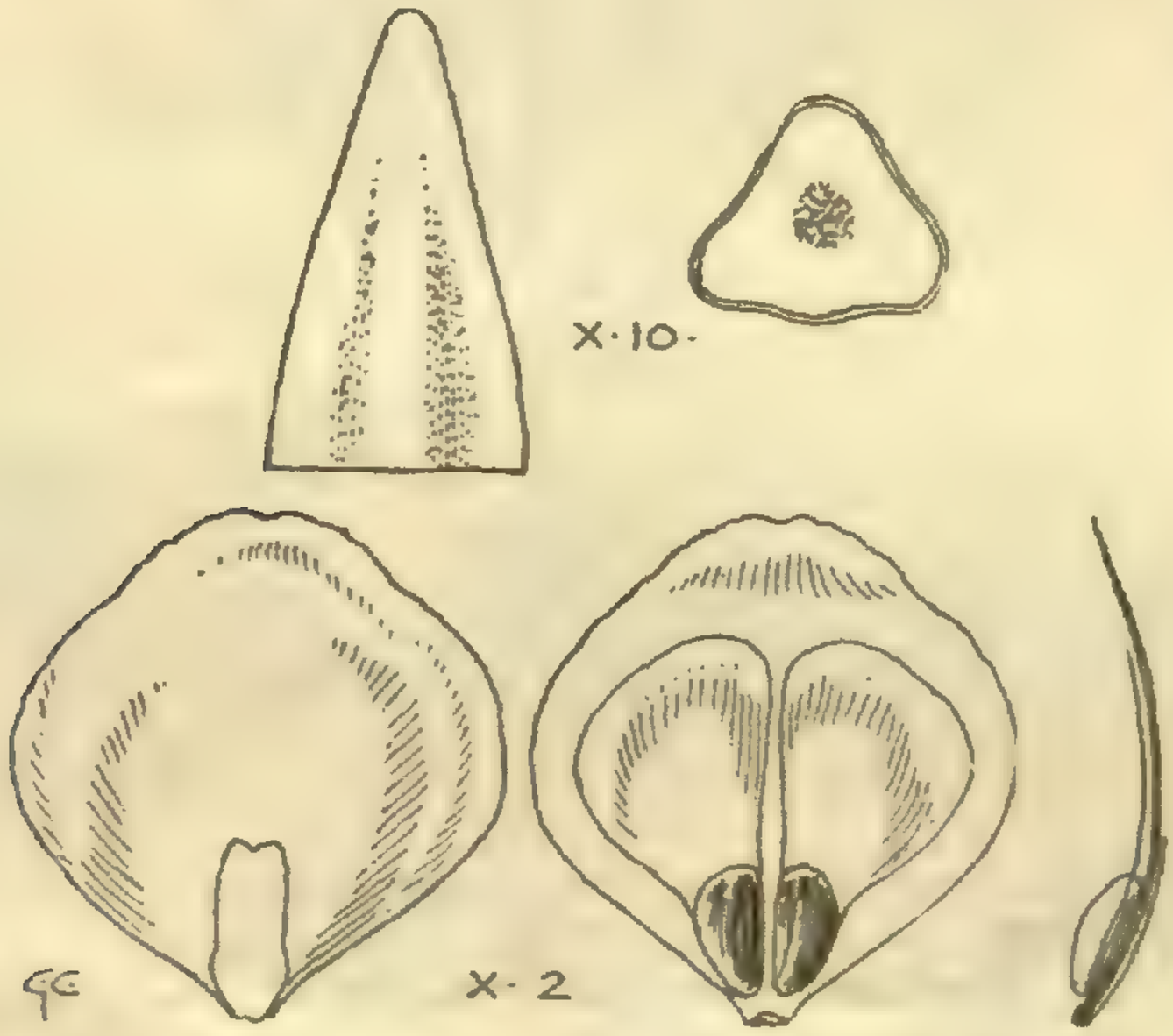
Cephalotaxus drupacea Sieb. et Zucc. West Hupeh, *Wilson*, 100*a*! Japan.—*C. Fortunei* Hook. West Hupeh, *Wilson*, 100!—*C. Oliveri* Mast. in Gard. Chron. April, 1903, p. 227, fig. 93. West Hupeh, *Wilson*, 72!—*C. Griffithii* Hook. fil. West Hupeh, *Wilson*, 714, 2114*a*! Occurs also in Burmah.

Taxus baccata L. West Hupeh, *Wilson*, 479, 624! The specimens are remarkable for the rich brown colour of their under surface. Possibly they should be referred to *T. cuspidata*, but the evidence is not sufficient to enable the point to be definitely decided.

Torreya nucifera Sieb. & Zucc. *Wilson*, 624*a*! Grows also in Japan.

Podocarpus argotænia Hance. *Wilson*, 1894!

Pinus (§ *Cembra*) *Armandi* Franchet, Gard. Chron. 1903, p. 66, f. 3, p. 31. Hupeh, *Wilson*, 662! 829! — *P. Bungeana* Zucc.



PICEA WILSONI Mast. — Apex of leaf and cross-section, magnified ten diameters. Cone-scale with bract and seeds; section through scale and seeds, magnified two diameters.

Wilson, no ticket— *P. koraiensis* Sieb. & Zucc. Gard. Chron. 1903, p. 34, fig. 18, 19. *Wilson*, 597! This species is native also to Kamtschatka, Korea, and perhaps Japan.—*P. Massoniana* Lamb. non Sieb. & Zucc. West Hupeh, *Wilson*, 293! This is the *Pinus sinensis* of Endlicher, Bentham, and others, and it is unfortunate that it cannot retain that name. Lambert's type, labelled "Pro-mont. b. Spei Fr. Masson. culta e seminibus chinensibus," is in the Banksian Herbarium.

Picea ajanensis Fisch. West Hupeh, *Wilson*, 1896! The species is known also in Amoorland and Japan.—*P. Alcockiana*. Carrière, *Wilson*, 1896! Mr. Wilson collected numerous cones of this species, so that the hesitation expressed as to the identity of the specimens collected by Dr. Henry and the Abbé David (Journ. Linn. Soc. xxvi. 553) need no longer be felt. Mr. Wilson speaks of it as one of the most striking conifers he met with. It is also

a native of the mountains of Japan.—*P. neoveitchii* Masters in Gard. Chron. 1903, Feb. 21, p, 116, fig. 51. A very distinct-looking *Picea*, of which Mr. Wilson saw only one tree in West Hupeh, at an altitude of 5500 ft., and of which he was unable to procure seeds. In order to avoid the confusion with *Abies Veitchii*, sometimes called *Picea Veitchii*, I have adopted the name *P. neoveitchii*.—*P.*

KETELEERIA EVELYNIANA Mast.—To the left a cone; in the centre foliage and leaf-section; to the right, portion of branch showing leaf-scars; cone-scales seen from the back, front, and side; winged seeds all real size except the leaf-section, which is magnified ten diameters.

Wilsoni Masters in Gard. Chron. 1903, Feb. 28, p. 133, fig. 56. *Wilson*, 1827*a*!

Keteleeria Davidiana Beissner. Masters in Gard. Chron. Feb. 7, 1903, p. 84, fig. 37, 38. West Hupeh, *Wilson*, 426! 430! Mention may here be made of a new species, *K. Evelynæ*, discovered by Dr. Henry, and figured in the *Gardeners' Chronicle*, March 28, 1903. The illustration is here reproduced.

Tsuga Sieboldii Carrière. West Hupeh. *Wilson*, 572, 1898! Native also in Japan.

Abies firma Sieb. & Zucc. West Hupeh, *Wilson*, 1895! This species was originally made known from Japan.

NOTES ON WESTERNESS PLANTS.

By C. E. Salmon, F.L.S.

In August of last year I was able to spend a fortnight botanizing in the neighbourhood of Corpach, a village about four miles north-west of Fort William, and prettily placed at the junction of Loch Eil with Loch Linnhe.

On all sides extensive deer-forests somewhat hampered one's botanical wanderings, but I should like to express my gratitude to the following gentlemen, who most kindly allowed permission for botanizing upon their property—to the Earl of Morton, whose attractive-looking mountains at Conaglen had to be taken on a wet misty day; to Sir E. G. Loder, to whom belonged the fascinating peaks of Gulvain, and to Earl Cadogan.

The Ben Nevis range was not explored, and the main peak (4406 ft.) only attempted on a day that proved very wet with a thick driving mist; at the summit it was intensely cold.

This range, with its various peaks of Aonach Mor, Aonach Beg, Stob Coire an Easain, &c., has been carefully examined by Mr. G. C. Druce (Ann. Scott. Nat. Hist. 1892, p. 127), and Rev. E. S. Marshall & W. A. Shoolbred (Journ. Bot. 1897, p. 65).

One of the most interesting hills explored was Gulvain, with its two distinct peaks (3148 ft. and 3224 ft.), connected by a narrow col; here ptarmigan were seen, and a magnificent example of the White-tailed eagle watched within a range of twelve yards! The crags on the north-eastern face of this mountain deserve better exploration than time would allow me to give them. It was here I saw *Cochlearia micacea*, *Carex stellulata* var. *grypus*, *C. pulla*, &c.

Stob Coire a' Chearcaill (2527 ft.), near Conaglen, is an attractive-looking mountain at the head of a magnificent corrie—a "sanctuary" for deer—and the rocks overlooking this gorge produced several interesting *Hieracia*, and a Grey mountain hare! The long range of Druim Fada, behind Corpach—Stob a' Ghrianain (2420 ft.) its highest point—was taken on a wet misty day, and little crag work could be done.

Two very delightful days were spent at Invermoidart, on the west coast, at the invitation of Mr. S. M. Macvicar, who very kindly showed me several interesting species growing in the neighbourhood of Loch Moidart. I have indicated by Mr. Macvicar's initials all those plants noted in his company.

All the following records are within Watson's vice-county 97, but some (indicated by A) are in that portion of Argyll that he included with West Inverness to form that vice-county, Westerness.

I must thank Rev. E. S. Marshall, Rev. E. F. Linton, and Mr. F. Townsend for examining and naming various critical forms for me. Plants thought to be new county records are distinguished by an asterisk.

Thalictrum alpinum L. Gulvain.
**Ranunculus rectus* Bor. Glen Suileag.
Castalia speciosa Salisb. var. **minor* DC. Moidart, *S. M. M.*

Cochlearia officinalis L. Loch Eil side, near Corpach Mill.—**C. micacea* Marshall. Gulvain. "I quite think this is my *micacea*. Pods veinless. Just like the Ben Lawers plant," *E. S. M., in litt.* —**C. grænlandica* L. Arisaig, *Miss M. Taylor*; "? shade grown," *E. S. M.*

Sisymbrium officinale Scop. var. **leiocarpum* DC. Near Arisaig Station.

Subularia aquatica L. A. Lochan na Cruaich, near Conaglen.

Cerastium arcticum Lange. Ben Nevis.

Arenaria serpyllifolia L. Corpach.

**Sagina maritima* Don. Corpach. I do not think true *S. maritima* has been previously recorded for Westerness, although G. Don collected the plant now called var. *alpina* Syme on the top of Ben Nevis in 1794.—*S. nodosa* Fenzl and var. **glandulosa* Bess. Loch Eil side, near Corpach Mill, *Miss A. S. Taylor.*

Spergula arvensis L. var. *sativa* Boenn. Near Corpach Mill.

**Lepigonum salinum* Kind. Near Corpach Station.

Montia fontana L. var. *erecta* Pers. Corpach.

Geranium sylvaticum L. Glen Nevis, near Meall Cumhann.

†*Trifolium hybridum* L. Glen Finnan, near head of Loch Shiel.

Geum rivale L. Glen Nevis, near Meall Cumhann.

Potentilla Sibbaldi Hall. fil. Gulvain.

Alchemilla vulgaris L. var. **alpestris* Schmidt. A. Coire a' Chearcaill.—*A. alpina* L. North cliffs of Stob a' Ghrianain.

Rosa spinosissima L. Corpach.

Saxifraga stellaris L. North cliffs of Stob a' Ghrianain; Glen Nevis; Gulvain, &c.—*S. aizoides* L. Druim Fada; Glen Suileag; Glen Nevis, &c.—*S. hirta* Haw. Gulvain. A. Cliffs of Stob Choire a' Chearcaill.

Chrysosplenium oppositifolium L. Gulvain.

Parnassia palustris L. Glen Suileag; near Loch Arkaig; near Arisaig.

Sedum roseum Scop. Glen Nevis, near Meall Cumhann.

Epilobium obscurum Schreb. Corpach.—**E. montanum* × *obscurum*. Invermoidart, Loch Moidart, *S. M. M.*—*E. anagallidifolium* Lam. Gulvain, north-east side.—*E. anagallidifolium* × *obscurum*. A. Coire a' Chearcaill, near Conaglen.—*E. alsinefolium* Vill. Ben Nevis, *Miss M. C. Taylor.*

Circæa alpina L. Shore of Loch Linnhe near Caol.

Carum verticillatum Koch. Glen Nevis, plentiful.

Œnanthe crocata L. Corpach.

Ligusticum scoticum L. Invermoidart, *S. M. M.*

Cornus suecica L. Gulvain. A. Coire a' Chearcaill, very fine.

**Adoxa moschatellina* L. Corpach.

Galium boreale L. Valley south of Meall Onfhaidh.—*G. palustre* L. var. *Witheringii* (Sm.). Corpach.

Valeriana Mikanii Syme. Shore of Loch Linnhe near Caol, and at Corpach.

Antennaria dioica R. Br. Glen Nevis, near Meall Cumhann; Gulvain; near Banavie. A. Coire a' Chearcaill.

Gnaphalium supinum L. Gulvain; north cliffs of Stob a' Ghri-

anain; A. Cliffs of Stob Choire a' Chearcaill. — *G. sylvaticum* L. Near Banavie.

Carduus heterophyllus Willd. North cliffs of Stob a' Ghrianain; Glen Nevis, near Meall Cumhann.

Saussurea alpina DC. Gulvain.

**Cichorium Intybus* L. Near railway near Kinlocheil, *Miss E. I. Cooke.*

Crepis paludosa Moench. Corpach.

Hieracium lingulatum Backh. Druim Fada, near Corpach; Ben Nevis.—*H. atratum* Fr. A. Coire a' Chearcaill, near Conaglen. "I think *atratum*," *E. F. Linton.* — **H. sinuans* F. J. Hanb. A. Coire a' Chearcaill. "Appears to be weak *H. sinuans*," *E. F. L.*— *H. callistophyllum* F. J. Hanb. var. **glandulosum* F. J. H. Ben Nevis; A. Coire a' Chearcaill.—*H. anglicum* Fr. vars. *longibracteatum* F. J. H. and *cerinthiforme* Backh. Meall Cumhann, Ben Nevis. — *H. Sommerfeltii* Lindeb. A. Coire a' Chearcaill, near Conaglen.—*H. rivale* F. J. Hanb. and var. **subhirtum* F. J. H. Ben Nevis.—*H. murorum* L. pt. var. **sanguineum* A. Ley. Druim Fada, near Corpach. — *H. vulgatum* Fr. var. **sejunctum* W. R. Linton. Meall Cumhann, Ben Nevis. — *H. sparsifolium* Lindeb. A. By R. Callop, near Loch Shiel.—*H. corymbosum* Fr. A. By Loch Eil between Drumfern and Garvan.

Vaccinium uliginosum L. A. Coire a' Chearcaill.

Loiseleuria procumbens Desv. Summit of Stob a' Ghrianain; Gulvain.

Pyrola media Sw. In fruit at Invermoidart, *S. M. M.*

Centunculus minimus L. Very fine on the shore near Arisaig.

Samolus Valerandi L. Arisaig.

Gentiana campestris L. Shona Beag, Loch Moidart, *S. M. M.*; near Banavie. A. South shore of Loch Eil.

Menyanthes trifoliata L. Corpach.

Myosotis repens G. Don. Near Corpach Mill.—*M. palustris* Relh. var. **strigulosa* M. & K. and *M. versicolor* Reichb. Corpach.

Veronica serpyllifolia L. var. *humifusa* (Dickson). Ben Nevis.

Euphrasia borealis Towns. A. Near Loch Eil, between Garvan and Drumfern. — *E. gracilis* Fr. Corpach. — *E. brevipila* B. & G. Corpach. Mr. F. Townsend reports: "Yes; some specimens possibly *E. brevipila* × *Rostkoviana*."

Rhinanthus **stenophyllus* Schur. (*Alecterolophus stenophyllus* Stern.). Near Loch Shiel, by Glen Finnan. — *R. minor* Ehrh. A. A rather peculiar form of this occurred by Loch Eil, between Drumfern and Garvan. Mr. Marshall agrees that it is best placed so.—*R. Drummond-Hayi* F. B. White (*A. Drummond-Hayi* Stern.). Near Meall Cumhann, Glen Nevis.—*R. ? borealis.* A. Referring to specimens gathered in Coire a' Chearcaill, near Conaglen, the Rev. E. S. Marshall writes:—"These agree better with my specimens of *A. borealis* Sterneck, to which my only authentic *Drummond-Hayi* is referred by Sterneck; in fact, White's plants were partly *A. D.-Hayi* Stern. and partly *A. borealis* Sterneck."

Utricularia intermedia Hayne. A. Lochan na Cruaich, near Conaglen.

Pinguicula lusitanica L. Near Banavie.

Scutellaria minor Huds. This very scarce plant in Scotland occurs sparingly at Invermoidart, *S. M. M.* — *S. galericulata* L. Abundant on the shore at Arisaig, &c.

Galeopsis versicolor Curt. Very fine, and quite colouring some of the fields at Corpach.

Ajuga pyramidalis L. Some rosettes, not flowering, were pointed out to me by Mr. Macvicar, near Acharacle, almost at sea-level.

Prunella vulgaris L. A noticeable state with white flowers and *green* calyx occurred between Banavie and Corpach.

Salicornia herbacea L. Corpach.

Polygonum Raii Bab. Shore of Loch Linnhe near Caol, plentiful.

Salix herbacea L. Summit of Stob a' Ghrianain.

Juniperus nana Willd. Gulvain.

Malaxis paludosa Sw. By a hill-loch, north of Loch Moidart, *S. M. M.*

**Orchis ericetorum* Linton. Glen Nevis.

Habenaria bifolia R. Br. Corpach.

Tofieldia palustris Huds. Gulvain. A. Near Lochan na Cruaich, near Conaglen.

Juncus trifidus L. Gulvain. A. Cliffs of Stob Choire a' Chearcaill.—*J. triglumis* L. North cliffs of Stob a' Ghrianain.

Luzula spicata DC. With above and on Gulvain.

Sparganium affine Sch. var. *deminutum* Neum. (*teste* Beeby). In a hill-loch, north of Loch Moidart, *S. M. M.*

Eriophorum latifolium Hoppe. In Glen Suileag and on the southern slopes of Druim Fada.

Rhychospora fusca R. & S. By Lochan Dubh Torr an Tairbeirt; an additional locality for this usually southern species. The original station for this near Acharacle is in the Argyll portion of Westerness.

Carex dioica L. In Glen Suileag. — *C. pauciflora* Lightf. In Glen Suileag, and on the southern slopes of Druim Fada. By south-west end of Loch Lochy.—*C. stellulata* Good. var. **grypus* (Koch). Growing with *C. pulla* Good. Near summit of Gulvain, at about 3000 ft. "It seems to be as good var. *Grypus* as any I have gathered or seen," *Rev. E. F. Linton in litt.* "This is for me both *C. grypos* and *C. stellulata* Gooden. in *one*, as I have made *grypos* a syn. of *stellulata*," *C. B. Clarke.* If "*grypus*" is always as distinct as this from ordinary *stellulata*, it seems quite worth while to distinguish it by name. The dark brown glumes relieved by a green nerve, the smaller more oblong spikelets, and the longer leaves which overtop the stem seem to distinguish this sufficiently from the type. Some of the specimens I gathered seemed inclined to throw out stolons. I am not sure that this form has been met with previously except in Perthshire. — *C. rigida* Good. North cliffs of Stob a' Ghrianain; Gulvain. A. Cliffs of Stob Choire a' Chearcaill.—*C. fusca* All. Through the kindness of Mr. Macvicar I was much interested in seeing this species still growing in its locality discovered by Mr. W. F. Miller in 1895; it was in fair quantity.—*C. Goodenowii* J. Gay, *forma*. A. By R. Callop as it enters Loch Shiel. "Seems to be a form of *juncella* with long

fruit and very *green* spikelets. The female glumes are membranous-(hyaline) bordered," *E. S. Marshall in litt.*—*C. limosa* L. Plentiful by a hill-loch, north of Loch Moidart, *S. M. M.* — *C. pallescens* L. Glen Suileag.—*C. filiformis* L. Near Arisaig.

Deschampsia flexuosa Trin. var. *montana* Hook. fil. Summit of Gulvain.

Hymenophyllum tunbridgense Sm. and *H. unilaterale* Bory. Growing together on shady rocks under trees at Invermoidart ; the former seems to be very scarce so far north, *S. M. M.*

Asplenium Adiantum-nigrum L., *A. Trichomanes* L., *A. Ruta-muraria* L. Corpach. — *A. marinum* L. Rocks near sea, Loch Moidart, *S. M. M.*

Lastræa Oreopteris Presl. Corpach, abundant.

Phegopteris Dryopteris Fée and *P. polypodioides* Fée. Invermoidart, *S. M. M.*

Equisetum sylvaticum L. Valley south of Meall Onfhaidh.—**E. hyemale* L. Sparingly on Gulvain, at about 1750 ft. Mr. Bennett tells me it is very scarce in West Scotland, and its occurrence at this elevation was previously unknown to him; see his article in Ann. Scott. Nat. Hist. for January, 1903.

Lycopodium Selago L. North cliffs of Stob a' Ghrianain. — *L. inundatum* L. By Lochan Dubh Torr an Tairbeirt.—*L. annotinum* L. A. Very fine in Coire a' Chearcaill, near Conaglen.—*L. clavatum* L. A. With the above, but evidently not common in this district. —*L. alpinum* L. North cliffs of Stob a' Ghrianain.

NOTES ON ATLANTIC DIATOMACEÆ.*

By George Murray, F.R.S.

No fact of general bearing has been more clearly established by a year's (1897) observations than the coastal character of the diatom flora of the ocean. A few species were present in nearly every capture, however remote from land, e.g. *Rhizosolenia styliformis* Brightw., *Coscinodiscus radiatus* Ehrenb., and, in smaller quantity, *Hemidiscus cuneiformis* Wall. *Rhizosolenia setigera* Brightw., *R. alata* Brightw., and *Thalassiothrix longissima* Van Heurck, were next in order in point of constancy ; while in the warmer seas *Asterolampra Marylandica* Ehrenb. was almost invariably present. During the colder half of the year *Planktoniella Sol* Schütt was fairly frequent ; and in the Caribbean Sea *Climacodium biconcavum* Cl. was at all seasons nearly constant. More rarely *Eucampia zodiacus* Ehrenb., *Cocconeis Scutellum* Ehrenb., fragments of species of *Chætoceros* (frequently *C. borealis* Bail.), and *Skeletonema costatum* Cl. were present, but never in plenty. These diatoms in the order given were fairly characteristic of the ocean remote from land, never in

* The principal material for the following notes was collected by Messrs. G. Murray and Blackman by the pumping method.

great quantity as compared with *Peridinieæ*, &c., but in one form or other never absent.

The facies of the phyto-plankton flora changed, however, on approaching land, and while this is generally true of all the voyages, it was especially marked and striking to us on the voyage we accompanied. This may be best illustrated by the following fact. On our return seven gatherings were selected, on account of their abundant diatom contents, to be submitted to the late Mr. Thomas Comber for expert determination. They were as follows:—

No. 13.—Para, Voyage III. Lat. 35° 47′ N.; long. 28° 37′ W. *Rhizosolenia alata* Brightw., *R. setigera* Brightw., *Chætoceros borealis* Bail., *Coscinodiscus crassus* Bail., *Thalassiothrix Frauenfeldii* Grun., and *T. longissima* Van Heurck.

No. 28.—Lat. 17° 58′ N.; long. 53° 32′ W. *Rhizosolenia alata*, *R. setigera*, *R. styliformis*, *Chætoceros borealis*, *C. Lorenzianus* Grun., *C. decipiens* Cl., *Bacteriastrum varians* Laud., *Guinardia flaccida* Per., *Hemiaulus Hauckii* Grun., *H. membranaceus* Cl., *Coscinodiscus nodulifer* Jan., *C. crassus* Bail., *Hemidiscus cuneiformis* Wall., *Asterolampra Marylandica* Ehrenb., *Pseudoeunotia doliolus* Grun., *Fragilaria dubia* Grun., *F. Nitzschioides* Grun., and *Spermatogonia antiqua* Brun. (But this last is not a diatom, though often so reckoned.)

No. 30.—Lat. 14° 55′ N.; long. 57° 26′ W. *R. styliformis*, *R. Stolterfothii* Per., *Guinardia flaccida*, *C. borealis*, *C. Lorenzianus*, *C. decipiens*, *C. coarctatum* Laud., *Bacteriastrum varians*, *Hemiaulus membranaceus*, *Coscinodiscus nodulifer*, *C. Kutzingii* var. *ocellata* (new variety with a marginal pseudo-nodule, as in *Actinocyclus*), *Hemidiscus cuneiformis*, *Asterolampra Marylandica*, *Fragilaria Nitzschioides*, *Stigmatophora rostrata* Wall., *Tropidoneis antarctica* Cl., *Eucocconeis molesta* Cl., and *Spermatogonia antiqua*.

No. 31.—Same latitude and longitude, approximately. *R. styliformis R. Stolterfothii*, *C. borealis*, *C. Lorenzianus*, *B. varians*, *Hemiaulus membranaceus*, *Coscinodiscus nodulifer*, *Asterolampra Marylandica*, *F. Nitzschioides*, *Nitzschia producta* n. sp., and *Spermatogonia antiqua*.

No. 36.—Lat. 16° 6′ N.; long. 68° 10′ W. *Rhizosolenia indica*, *R. alata*, *R. rigida* Per., *R. styliformis*, *R. setigera*, *R. Megatherium*, n. sp., *Chætoceros borealis*, *C. decipiens*, *C. Lorenzianus*, *Climacodium Frauenfeldianum* Grun., *Coscinodiscus nodulifer*, *C. Kutzingii* var. *ocellata*, *Asterolampra Marylandica*, and *Fragilaria* sp. [Note.—With reference to the abundance of species of *Rhizosolenia* in this place, we subsequently found (voyage of 'Atrato,' lat. 16°–18° N., long. 68°–75° W., 1–2 December) a vast shoal of *Rhizosolenia*, principally *R. styliformis*, extending apparently for three hundred knots towards the coast of Hayti on this part of the track.]

No, 45.—Near Colon. *R. alata*, *R. styliformis*, *R. calcar-avis* Schultze, *Guinardia Blavyana* Per., *Chætoceros borealis*, *C. Lorenzianus*, *C. distans* Cl. var. *secunda*, *C. affinis* Laud., *C. rudis* Laud. Fort., *C. pelagicus* Cl., *C. atlanticus* Cl., *C. Weissflogii* Sch., *C. Lauderi* Ralfs (endocysts only), *B. varians* (with var. = *B. hyalinum* Laud.), *Hemiaulus chinensis* Grv., *H. Hauckii*, *Coscinodiscus nodulifer*, *C. crassus*, *C. gigas* Ehrenb., *C. apiculatus* Ehrenb., *C. centralis*

Ehrenb., *Actinocyclus subcrassus* Rattr., *Asteromphalus flabellatus* Grev., *Paralia sulcata*, *Cyclotella striata* Grun., *Thalassiothrix Nitzschioides* Van Heurck, *T. longissima*, *Nitzschia producta*, and *Fragilaria Nitzschioides*.

No. 46.—Near Colon. *R. alata*, *R. styliformis*, *R. calcar-avis*, *R. robusta* Norm., *Guinardia Blavyana*, *G. flaccida*, *C. borealis*, *C. Lorenzianus*, *C. distans* var. *secunda*, *C. didymus* Cl. var. *longicruris*, *C. affinis*, *C. Lauderi*, *C. rudis*, *C. pelagicus*, *C. atlanticus*, *C. furcellatus*, *Corethron criophilus*, *B. varians*, *Hemiaulus chinensis*, *H. Hauckii*, *Coscinodiscus nodulifer*, *C. crassus*, *C. convexus*, *C. radiatus* Ehrenb., *Actinocyclus subcrassus*, *Asteromphalus flabellatus*, *Cyclotella striata*, *Ditylum undulatum* Schm., *Thalassiothrix longissima*, *T. Frauenfeldii*, *Nitzschia producta*, *Asterionella Bleakleii* Smith, *Fragilaria Nitzschioides*, *? Navicula pelagica* Cl., and *Spermatogonia antiqua*.

These seven tubes, specially selected as containing abundant diatoms in quantity, if not always in variety, it is interesting to observe, come from localities near coasts, *viz.*:—No. 13 within a day's steaming south St. Michaels, Azores; No. 28 within thirty-six hours of making Barbados; Nos. 30 and 31 within twelve hours of Barbados; No. 36 between Barbados and Hayti; and Nos. 45 and 46 near Colon (Isthmus of Panama). In none of the voyages are there any records like these remote from coastal waters, and the gradual increase of quantity of diatoms in the nets seems to be, as a rule, the sign of approaching land. In this respect the microscope might be claimed as an aid to navigation in the same way as Prof. Herdman has pointed out (from a study of the animal plankton) that it is quite easy to determine the passage from the Gulf Stream to the Labrador current. In subsequent voyages the gatherings obtained by Capt. Milner near Colon show the persistence, at all events from July to December, of the same rich diatom flora near Colon. It appears to be a more enduring phenomenon than the spring diatom shoals of our own coasts, and this is the more readily understood from the stable temperature of the Caribbean Sea.

Mr. Comber, who furnished us with the lists of the seven tubes, kindly supplied the following description of a new species noted:—

Nitzschia producta, n. sp. Valve linear-lanceolate; margins parallel for about central one-third of valve; ends attenuated, much produced. No longitudinal depression. L. 0·06–0·07 mm., B. 0·008 mm. Striæ transverse, 19–20 in ·01 mm., composed of transversely elongated puncta, 14 in ·01 mm., those of adjacent rows being alternate to each other, so as to form oblique rows. Keel puncta marginal, 9 in ·01 mm., rather inconspicuous.

Locality. Atlantic Plankton, lat. 14° 55′ N. to long. 7° 26′ W.; and West Indies.

Belongs to § *Panduriformes*, but is not constricted.

ARABIS CILIATA R. Br.

[To the *Revue de Botanique Systématique* for May, 1903, M. Georges Rouy contributes an article on *Arabis ciliata* R. Br., specimens of which, collected on sandhills in South Kerry, June 24th, 1902, by the Rev. E. S. Marshall, I lately had the pleasure of communicating to M. Rouy. The article possesses considerable interest, and I have therefore prepared the following notice, which is, in fact, all but a literal translation, feeling assured that it cannot fail to be acceptable to British botanists.—Frederick Townsend.]

Almost always in exchange catalogues, and even in some floras, the name *Arabis ciliata* R. Br. is given for the alpine species *A. ciliata* of Koch, and of most botanists of Central Europe, but not of Robert Brown, and to which Shuttleworth, from 1835, in private communications, and, in 1838, Godet in Enum. Vég. Vasc. Cant. Neuchatel, p. 38, gave the name *A. arcuata*, with a var. *hirsuta* Godet (Fl. Jura, p. 38), of which *A. alpestris* Schleich ap. Reichenb. Icon. Germ. ii. p. 13, is a synonym. Thus many botanists think that they have in their herbaria the rare *A. ciliata* R. Br., whereas they have only the *A. arcuata* Shuttleworth, of fairly extended distribution.

A. arcuata is well known both by the numerous specimens sent out by collectors, and by the descriptions given by Godet, *l. c.*, and by Rouy & Fouc., Flor. de Fr. i. p. 216. But it is quite otherwise with *A. ciliata* R. Br., which is an inhabitant of sandy and rocky ground on the sea-coast in a limited area in the east of Ireland and in Pembrokeshire.

Prof. Babington's short diagnosis in his *Manual* is sufficient to distinguish *A. ciliata* from other species of the British flora, but it is not sufficient to separate it from other European species, and from the numerous allied subspecies, forms, and vars. M. Rouy has consequently drawn up a new and lengthened description from the South Kerry examples :—

Arabis ciliata R. Br. ap. Ait. Hort. Kew. ed. ii. v. iv. p. 107 ; Godet, Fl. Jura, p. 38 (in annot.) ; Eng. Bot. t. 1746 ; Babington, Manual of Brit. Bot. ed. viii. p. 27. Plant 8–20 centim. ($3\frac{1}{4}$–8 in.) in height. *Stems simple, glabrous or hirsute below ; when in flower lax, erect, not arcuate above ; when in fruit stiff, raceme equalling or exceeding the remaining portion of the stem. Leaves thick* more or less, *with long ciliæ*, glabrous or furnished with more or less numerous hairs on both upper and under surfaces (var. *hispida* Syme) ; root-leaves in a rosette, oblong or spathulate, subsessile or narrowed into a broad but short petiole, entire or faintly denticulate ; *stem-leaves numerous, crowded, sessile, narrowed below*, with more or less rounded truncate base, *not auricled*, quite entire, inferior ones lanceolate, subobtuse ; upper sublinear, shorter and acute. Flowers small ; *sepals* equal at their base, *lanceolate*, purplish throughout their upper half ; petals white, with narrow limb, linear-oblong, erect. *Fruiting raceme* relatively *long*, pods crowded ; *pedicels longish*, 4–7 millim. ($2\frac{1}{2}$–$4\frac{1}{2}$ sixteenths in.), erect, contiguous to the axis of the raceme ; *pouches erect*, very torulose, *tetragonous, short*, 20–25

millim. (13–16 sixteenths in.); seeds ovate, narrowly winged at the summit on one side only. Biennial. June–July.

The above diagnosis shows that *A. arcuata* Shuttlew. (*A. ciliata* (Tausch), Koch, Syn. (ed. ii. p. 42)) differs from *A. ciliata* R. Br. by the following characters:—Stems longer; *stem-leaves distant*, less numerous and distributed throughout a larger portion of the stem; *flowers* at least twice the size; *sepals elliptic-oblong;* fruiting corymb relatively *shorter*, *pedicels short*, *spreading-ascendant*, more or less *arcuate*, *distant from the axis;* pouches less slender, *broader* and *shorter*, 15–20 millim. (10–13 sixteenths in.); *seeds not winged.*

The real affinity of *A. ciliata* R. Br. is with *A. hirsuta* Scop. (*sensu lato*), and one might say that it is a form of *A. hirsuta* Scop. (*sensu stricto*); Rouy & Fouc. Fl. Fr. i. p. 215, which is nearly related to the form *A. Retziana* Beurl. (*Turritis hirsuta* var. *glabra* L. Iter. Gotl. pp. 192, 228, and *T. alpina* L. Syst. ed. xiii. p. 443, quoad pl. Gotland) of the same type (a form which Swedish botanists distribute with the ill-chosen name "*A. hirsuta* L. *β glabrata* L."), and, above all, with the var. *curtisiliqua* Rouy & Fouc. (*A. curtisiliqua* DC. Syst. i. p. 144).

A. Retziana and the var. *curtisiliqua* differ from *A. ciliata* R. Br. by the following characters:—Stem-*leaves* more *numerous* and distributed throughout two-thirds to four-fifths of the stem; *fruit corymb* much *shorter and laxer; leaves* usually *broader*, glabrous or hirsute, but with shorter ciliæ; *pouches longer*, 3–4 centim. (19–25 sixteenths in.); seeds broader, &c.

A. Retziana and the var. *curtisiliqua* are found in the seaboard counties in Great Britain, in Norway, and South Sweden.

SPHÆROBOLUS DENTATUS W. G. Sm.

By Worthington G. Smith, F.L.S.

Withering in the third edition of his *Arrangement of British Plants*, 1796 (iv. 356–7) describes four species of *Nidularia*:—*N. campanulata*, *N. striata*, *N. lævis*, and *N. dentata*. None of these plants are now placed under *Nidularia*. Withering's *N. campanulata* is *Cyathus vernicosus*, his *N. striatus* is *C. striatus*, and his *N. lævis* is *Crucibulum vulgare*.

Nidularia dentata has long been a mystery. Nothing corresponding with the description has been met with since Withering's time. Although Withering gives numerous references to illustrations of the first three species, he gives none for the fourth; and although he says the first three are common, he does not say a word as to the rarity or commonness of the fourth.

The following is Withering's description:—"Turban-shaped; pale buff; with 5 teeth at the edge; smaller than a hemp-seed. Colour pale buff; rather woolly; segments or teeth at the edge broad, spear-shaped, regular. Membrane tough, whitish. Seeds or capsules reddish-brown. Several growing together on rotten twigs, near the grate at Edgbaston Pool." This description is un-

like anything belonging to *Nidularia*. The size, and the mention of teeth, clearly point to the genus *Sphærobolus*.

Amongst the Wheeler drawings of fungi in the National Collection at the British Museum are four of typical *Sphærobolus stellatus*, and a fifth labelled with the same name, but clearly a very different plant. This really seems to be the *Nidularia dentata* of Withering. At a glance it is seen to be something quite distinct from *Sphærobolus stellatus*, and may safely be named *S. dentatus*.

The following are contrasted characters of the two species:—

Sphærobolus stellatus.	*S. dentatus*.
At first wholly immersed in profuse white mycelium.	Mycelium, if any, very scanty, and brownish.
Peridium externally white or nearly so.	Peridium externally pale livid buff to vinous brownish, pale brown or brown, thinly covered with fine erect white hairs.
Peridium opening with 6–7 somewhat broad, sharp teeth, glabrous at the edge.	Peridium opening with 4–7 acute teeth, clad with fine long converging white hairs at the edge, which in infancy cover the opening as in some *Peziza*.
Interior of peridium biscuit-colour, yellow or orange.	Interior of peridium white, ivory, white-greyish, or faint olive-ivory.
Peridiolum pale yellowish to orange.	Peridiolum reddish brown.
Habit, usually crowded.	Habit, scattered.
Average diameter $\frac{1}{10}$ inch.	Average diameter $\frac{1}{16}$ inch.
Habitat, sawdust, wood, twigs,&c.	Habitat, dead elder.

Sphærobolus dentatus (With.) W. Sm.—Peridium finely pilose with erect hairs, springing from scanty brownish mycelium, opening above in a 4–7-stellate manner, the rays clad with long white hairs, which at first converge over the opening; outside pale livid-buff to vinous brownish, pale brown, or brown; inside white, ivory, white-greyish, or faint olive-ivory; ejecting a reddish-brown peridiolum. $\frac{1}{16}$ in. diam. Scattered. Dead elder, Failand, Somerset. R. Baker. Aug., 1888.

THE OXLIP, COWSLIP, AND PRIMROSE.

By Edward G. Gilbert.

In April of this year I was at Montreux, and observing that in that neighbourhood *Primula elatior* Jacq. and *P. veris* L. are very abundant, and *P. acaulis* L., though much less so, is fairly frequent, I made a point of carefully noting what the relations of the three were, and particularly if there were any crosses between them, and where they occurred. *P. veris* and *P. elatior* each occur in vast numbers on the hill-sides, and in the flat marshy valley of the Rhone near Villeneuve, but never intermixing very freely. It

appeared to me that the latter was in the slightly moister places, especially the banks of the shallow dykes, while the former occupied the somewhat drier ones. What determined the presence of *P. acaulis* appeared to be partial shade, as a wood, or lessening of the effect of the direct rays of the sun by the slope of the ground at a greater angle to them than that of the general surface. In one spot only did I find all three forms growing together. That was a small tract of the marsh, not more than fifty yards in extent each way, adjoining a little wood on its south-western side, about a mile from Villeneuve. Here only also did I find what at first I took to be the caulescent variety of *P. acaulis*, but afterwards, on careful detailed examination and comparison, judged to be probably crosses between *P. acaulis* and *P. elatior*. One leading feature which led to the change of my opinion was the length of the hairs on the upper surface of the leaves, which appears to me to be a distinguishing feature (here, at least) of *P. elatior*, the corresponding part in both *acaulis* and *veris* being furnished with only very short pubescence, so that on careless examination it is apt to appear glabrous. In other respects these plants were intermediate in character between *P. acaulis* and *elatior*. On the aforesaid spot, as occasionally elsewhere, were specimens of crosses between *P. acaulis* and *P. veris*, such as, I think, are generally acknowledged to be such.

P. elatior appears to me a more variable plant than either *acaulis* or *veris*, especially in the form of its leaves, which, while typically even more than those of *P. veris*, are contracted up to their middle, are occasionally very much like those of *acaulis*. Such leaves, however, retain the characteristic hairs of their upper surface, so far as my observation goes, which greatly helps to distinguish them from those of the hybrids *acaulis* × *veris*.

An interesting question appears to me here to arise. Does not this greater variability of *P. elatior* point in the same direction as its intermediate character, both in form and habit between *acaulis* and *veris*, i. e. to its origin in the long past to a cross between those two? (Perhaps its comparative scarceness in Britain, by the way, may be connected with the superior drainage of that country.)

Are not the inter-relations of these Primulas very similar to those of the forms of the fruticose Rubi (and of other confusing genera), in which there are countless intermediates between certain well-defined forms, many of these intermediates being comparatively very rare, like the *Primula* hybrids? Kölreuter and Darwin have pointed out the "similarity between the variability produced by crossing distinct species, and that which may be observed in plants and animals when reared under new or unnatural conditions" (see *The Origin of Species*, chap. i.). On the small area of Tunbridge Wells Common are found forty different forms of Rubi, or thereabouts; some difficult to separate from others, others plainly intermediate in character. It is difficult to see how they can here have originated "under new conditions." Is it not therefore much more probable that they have done so by crossing?

Since writing the above I have seen at Chailly, near Vevey, a meadow in which grew numerous plants of *P. veris* quite up to a low stone wall on its northern side. Not one *P. acaulis* was to be seen among them, but immediately beyond the wall, and extending for a few feet only from it, *P. acaulis* was abundant. The wall stood on no bank or slope, and I could perceive nothing different in the conditions on the two sides of it, except that of course the meadow on its north side for a little way was shaded from the mid-day sun. There was no *P. veris* among the *P. acaulis*, but further to the north from the wall *P. veris* occurred again without *P. acaulis*. I could not but connect the presence of *P. acaulis* and the absence of *P. veris* with the wall; yet the wall, though not a new one, must have been of trifling duration compared with the time generally accepted as necessary for the conversion of one species into another.

On a small grassy mountain slope I found the three Primulas growing, but *acaulis* was almost confined to the parts sloping least to the south, and *elatior* to those most soaked with moisture.

BIBLIOGRAPHICAL NOTES.

XXX.—L. A. Deschamps and F. Noronha.

1. L. A. Deschamps.

We have in the library attached to the National Herbarium a number of MSS. by L. A. Deschamps, who accompanied on the *Recherche* the expedition under D'Entrecasteaux sent out by the French Government in 1791 in search of La Pérouse. Deschamps and La Billardière were associated as naturalists to the expedition; but the account issued in 1808 by order of Napoleon contains no information as to their work, and barely mentions their names. It may therefore be worth while to say that the notes of Deschamps, which are very extensive, are readily accessible. According to a note by Dr. J. E. Gray (dated 30 Sept. 1845), the MSS. were purchased with a quantity of dry plants from Java at a sale at the India House, and presented to the British Museum by Mr. John Reeves. Besides a volume of mammalia, these include a complete Flora of Java, drawn up at Batavia in 1802, with two volumes, less extensive, apparently preliminary to the complete work, and a volume of rough notes; a folio volume containing various incomplete copies of the journal of the voyage, with some botanical notes, and an interesting series of questions relative to Java, drawn up at Batavia on Aug. 25, 1797, and signed by Jean Frédéric Spaenlin, which are partly answered by Deschamps. Two quarto volumes contain respectively his journal from the departure of the voyage in 1791 (not very regularly kept), at which time Deschamps was twenty-five years old, and accounts of his excursions in the island from 1798 until his departure for Mauritius in 1802. Besides

these there is an oblong folio volume of views in water-colour of the island, and a large number of pencil drawings of plants: these bear for the most part the local names and occasionally the determinations made in the MS., wherein are contained many unpublished genera; of many there are two copies. Of these Deschamps says in one of his MSS.: "Je joins a cet ouvrage une grande quantité de dessins, la plupart faite sur le champ d'après nature, d'autres d'après la plante séchié. Cette collection est faite pour compléter Reed et Rumphius. Ce qui y manque du côte du dessin est remplacé par l'exactitude des cartons."

It is difficult to ascertain much about Deschamps. He was, as has been said, twenty-five when he started for Java in 1791. He describes himself on the title-page of his MS. "Flore Javane" (1802) as "M.D. et chirurgien-major à Batavia." After this he apparently returned to France, as P. de Beauvois, in dedicating to him the genus *Deschampsia* in 1812, speaks of him as "médecin à Saint-Omer." Possibly the publication of this notice may elicit further information from some French botanist. It is evident from his MSS. that Deschamps was capable and industrious, and it is to be regretted that the knowledge of Javan plants which he undoubtedly possessed was not made public at a time when little was known of the botany of Java. The specimens which Reeves bought with the MSS. are apparently lost: there is no evidence that they were ever received at the National Herbarium. A volume dealing with mammalia, &c., formed part of the series, and is in the Zoological Department.

2. Fernando Noronha.

Among the drawings by Deschamps is a collection of 111 coloured figures, accompanied by a list of vernacular names headed "Notitie der Planten door den Heer Noronha gevonden in de Jaccatrase Bovenlanden zoo als dezelve bij den Inlander genaamd Worden." These seemed to me to correspond with the "Icones ineditæ 110 plantarum javanicarum servantur Samarangae in schola navali, et in Regia Bibl. Berolinensi" mentioned by Pritzel under Noronha, and Dr. Loesener has been good enough to confirm this opinion by comparing my description of them with the figures at Berlin: the difference in number is accounted for by the fact that in our set one species is represented by two drawings.

In what appears to be an introductory essay to a flora of Java (unfinished) Deschamps writes: "Un naturaliste espagnol, M. Norona, venant de Manille, entreprit un voyage dans l'intérieur de Java, où il avait fait une superbe collection; mais, des raisons particulières l'arrêtèrent dans sa course, il partit pour l'isle de France, où il mourut quelque temps après son arrivée, sans avoir pu mettre la dernière main à son ouvrage qui se trouve perdu pour les sciences à l'exception d'un catalogue des plantes du pays qui se trouve imprimé dans les mémoires de la Société de Batavie et quelques dessins qu'il avait laissés à Jan Predicat Diman [?] son Mécène et son ami." Deschamps makes no mention of his own

set of Noronha's drawings; it seems possible that he may have acquired later those left to Diman—if I correctly read his name.

It may be worth while to bring together the little that is known about Noronha. The introduction to vol. v. of *Verhandelingen van het Batav. Genootschap* (1790) contains the following account, for the translation of which I am indebted to Mr. B. D. Jackson, of contributions by Noronha printed in the volume; the translation is from the reissue in 1827, which was, I believe, a mere reprint:—

"2. The description of a plant, in the Malay speech named Rasamala, but in botany known under the name of *Styrax*. This plant was first discovered in this island and made known as *Styrax* by Mr. Noronha, a Spanish traveller and botanist, who had also been in the Manilas [Philippines] tracing out herbs and plants, and came hither with the same intent. Mr. Noronha has given this plant the name of *Altingia*, in recognition of the help afforded by the present Governor-General Alting in his investigations. This description, which we received from Mr. Noronha in Latin, we have subsequently turned into Dutch.

"3. A similar description of another plant, named in the Malay Rangas, and in botany known under the name of *Anacardium*, received also in Latin from Mr. Noronha, and here likewise imparted in Dutch.

"4. A catalogue of other plants which Mr. Noronha observed in the Jakatra [?] highlands, on one side with Latin, and on the other with Malayan names, for both of which the Society is indebted to Governor-General Alting, who, at our request, gave permission and further facilities to proceed to the highlands, for nobody, far less a foreigner, may go so far hence without special leave from the Governor-General, whereby we acquired the two descriptions mentioned in this Catalogue. We had flattered ourselves that Mr. Noronha would have imparted to us, not only somewhat from his collections in the Manilas [Philippines], but also descriptions of all the plants mentioned in his Catalogue; but he, who had not the pleasantest temper, and with whom one had to exercise more than common patience, was, after his return from the highlands, morose, melancholy, and even infirm, so that he suddenly resolved to depart by a French vessel to Mauritius, and then seek his native land, where he would doubtless have published his collection, had he not, according to news received, died at Mauritius shortly after his arrival there.

A translation of the paper on *Altingia* will be found in the *Annals of Botany* (ii. 323–330; 1805); on p. 381 of the same volume we find the following note:—"Noroña died at the Isle of France of an obstruction in the liver, contracted at Madagascar, whither he had been led by his love for the science. At his death he nominated M. Cossigny the heir of all his drawings and manuscripts, which that gentleman afterwards presented to the then Academy of Sciences at Paris. This learned body referred them to M. La Billardière, to be prepared for publication; but he was at that time too busily engaged in printing the journal of his own voyage. Perhaps we may see them brought forward at a future oppor-

tunity. The Spaniards have erected a monument to the memory of their indefatigable countryman in the island of Luzon, near Manilla, on the ground belonging to the royal botanic garden, which, during his residence there, Dr. Noroña had done everything in his power to bring into order, and to stock with many valuable plants."

The catalogue of plants, entitled "Relatio plantarum Javanensium iterfactione usque in Bandong recognitarum â Dno. F. Noronha," is a list of names, alphabetically arranged, with their Javanese equivalents, a large number of which represent species which their author considered new. There are unfortunately no descriptions; I had hoped that it might have been possible to correlate these with those on the drawings, but they do not correspond.

The *Genera Nova Madagascariensia* of Dupetit-Thouars (1808) contains several genera established by Noronha, as well as the genus *Noronhia*, named in his honour by Stadman. Appended to this are two pages, containing names of ferns and monocotyledons, mostly new species, with Mascarene equivalents, of a "Prodromus phytologicus" by Noronha, with the note:—"In lucem proditurum erat anno 1787, ope typographiæ regiæ Insulæ Franciæ, nisi fatum præmaturum authori obviam ivisset." This practically fixes the date of Noronha's death.

JAMES BRITTEN.

SHORT NOTES.

SALVIA PRATENSIS IN MONMOUTHSHIRE.—Dr. Vachell, of Cardiff, has sent me a beautiful specimen of this plant, gathered by Miss Eleanor Vachell in a field adjoining Rogiet Rectory, Newport. I am indebted to the Rev. W. Coneybeare Bruce for particulars of its occurrence. It is found in a field over a space some ten yards square, in which limestone is frequently an outcrop; the surface is dry, with short grass, among which the bee orchis occurs in thousands—*Habenaria bifolia*, *Gentiana Amarella*, and, later in the year, *Spiranthes autumnalis*. The *Salvia* occurs on the contour line of 100 ft., distant from the coast-line opposite Avonmouth one and one-sixth miles. There is no right of way through the field, and it borders a large wood. The Great Western Railway runs between the Rectory and the Severn, with a station near. Mr. Bruce says: "The garden here is quite new; mainly my own creation. It is quite certain that the *Salvia* is beyond suspicion in this respect." The only thing that may be held against it is the occurrence of *Crocus sativus* in a field near, but a small wood separates the two fields. With regard to its occurrence near a large wood, it is curious that this is the case in several other of its localities in England. It certainly seems to be a native plant in Kent and Oxfordshire, and "it may have some claims to be considered native in Bucks" (Druce, Fl. Berks., p. 400). In Surrey, Hants, and Wilts I think it is not native, nor do I consider it so in Berks. If admitted, dozens

of others might be that occur in grassy fields. Mr. Druce rightly considers its claims for that county "not established." On comparing the fresh specimen sent with the Eng. Bot. plate, I noted that the Monmouthshire plant had much less red in the flowers; they were of a lovely blue, slightly tinted or rather suffused with faint red. It is recorded in Fl. Warwicksh., p. 207, from "dry fields, east of Kineton." Mr. Baguall considers it "a denizen." It was also reported from the Isle of Wight (Fl. Vect. 376); but Mr. Townsend (Fl. Hampshire, 253) says it "can only be looked upon as a casual in Hants." Many other counties are put in square brackets in Top. Bot. ed. 2, 303.—Arthur Bennett.

[In the National Herbarium, besides a specimen from "near Tring, Bucks," collected by Mr. Druce in 1897, we have one collected by Mr. John Benbow in a "meadow at Colstrope, near Hambleden," in the same county, in June, 1885. Mr. Bennett rightly criticizes the dull colouring of the original plate in *English Botany*, the drawing for which has hardly any indication of colour; but the colouring of the reproduction in ed. 3, in which the lower lip is of a uniform pale grey, is hardly surpassed in inaccuracy by any of the figures in that artistically ill-treated work.—Ed. Journ. Bot.]

Scapania intermedia Hus. in Ireland.—While botanizing in July, 1902, at Galtee More Mountain, in South Tipperary, I gathered a nice tuft having perfect colesules of the hepatic *Scapania intermedia* Hus. It grew amongst *S. undulata* at 1800 ft., on sandstone rocks to the south of Lough Muskry. Professor Douin, of Chartres, to whom I sent the specimen, has kindly verified it. Though not hitherto recorded from Ireland, this plant has been previously found in Ireland, for quite recently, while looking through the Scapanias in the herbarium of the Rev. C. H. Waddell, I met with a specimen of *S. intermedia* collected by him so far back as July, 1887, in Colin Glen, County of Antrim. This is all I know of this hepatic in Ireland, but it may be contained in other collections, probably under *S. nemorosa*, of which, indeed, it is a beautiful miniature; the peculiar pale or whitish colour of the leaves and mostly rosy-tinted tops of the shoots are of great help in recognizing it.—H. W. Lett.

Simethis bicolor.—"Corycius senex" (*i. e.* the Rev. W. Tuckwell) says (Gard. Chron. July 18, p. 44) that the spot in Branscombe, Bournemouth, where the *Simethis* "still grows, not now profusely, is marked for the erection of houses during next year, and it can hardly escape destruction." The plant was discovered in 1847 by Miss Charlotte Wilson (not Wilkins as at first stated).

Teucrium Botrys.—I send you a plant of *Teucrium Botrys*. I found it growing in profusion in an uncultivated field at Godmersham, near Wye, Kent.—W. H, Hammond.

Meum athamanticum in Argyle (p. 139).—I recorded this for Dalmally in Journ. Bot. 1888, p. 368, and it is duly noted in Professor Traill's *Topographical Botany of Scotland* for Argyle.—G. Claridge Druce.

NOTICES OF BOOKS.

New Text Books.

Text-book of Botany. By Drs. Strasburger, Schenck, Noll, and Schimper. Second English edition, revised with the fifth German edition, by W. H. Lang, M.B., D.Sc. Large 8vo, pp. ix, 670, figs. 686. Weight, 3 lb. 10 oz. London: Macmillan & Co. 1903. 18s. net.

A Class-book of Botany. By G. P. Mudge and Arthur J. Maslen, 8vo, pp. xvi, 512, tt. 228. London: Arnold. 1903. Price 7s. 6d.

We welcome a new English edition of Prof. Strasburger's excellent text-book. Notices of the original English edition and of the various German editions having appeared from time to time in this Journal, and the book being so well known among teachers and students in this country, a complete review is unnecessary. We may, however, indicate the points of difference between the two English editions. The book has grown in size and weight. The translation of 1898 contained 632 pages and 594 figures. The increase in size in the present edition is due largely to the inclusion of the useful bibliography which was a feature of the later German editions.

The chapter on morphology is somewhat extended, and the paragraphs on cell-structure have been revised. The existence of centrosomes in association with the nucleus is still matter for discussion in the higher plants, but has been satisfactorily demonstrated in the lower cryptogams; it is shown in a figure of *Fucus serratus*. The paragraph on nuclear division has also been elaborated, and additional figures are given.

In the section on physiology we note some revision and additions by which the subject-matter is brought more up to date. In the portion dealing with the special botany of great groups there is a slight rearrangement of the lower classes of Thallophyta. Recent work on the origin of the simpler algæ finds expression in the recognition of *Flagellata* as Class 1, while *Bacteria* and *Cyanophyceæ* are regarded as distinct classes (in the earlier editions they were grouped together as Schizophyta), the origin of the former from the latter being still open to doubt, since "the cilia and endospores of the bacteria are unknown" in the algal group. The older system of classification of the Green Algæ is, however, still retained. In the Fungi we note the recognition of the sexuality of the Ascomycetes, and the introduction of several useful figures illustrating fertilization in the *Peronosporeæ* (after Wager), and the fertilization and development of the perithecium in *Sphærotheca* (after Harper). The arrangement of the families of seed-plants is as in the earlier edition; this part of the work is improved by the addition of several blocks, and there are also a few more of the very crudely coloured figures of poisonous and officinal plants, the presence of which has always been an undesirable feature of this text-book.

The second is a useful class-book adapted for students preparing for the Intermediate Science Examinations of the London University, and other examinations of a similar standard. Students

working under the guidance of a qualified teacher will find it a helpful book of reference, requiring (as in the case of most general text-books) some supplementing here and there, as well as the occasional exercise of the critical faculty. The numerous figures are not beautiful, but serve to indicate the points of structure and arrangement which the student must make out for himself in his practical studies.

The plan of arrangement is one which is to some extent necessitated by the lines of present-day examinations, embodying the study of a series of plant-types, ranging from typical seed-plants downwards to the Algæ and Fungi (Part I.). Part II. deals with the special morphology and classification of Angiosperms; in the systematic study of the families of Dicotyledons the authors cling to the old subdivision into two classes, Dichlamydeæ and Incompletæ. Part III., Physiology, is perhaps somewhat short. The authors are wise in introducing experimental proofs of some of the more important facts. Part IV. deals briefly with the technical description of plants and definition of terms.

A. B. R.

BOOK-NOTES, NEWS, &c.

Critical botanists will be equally surprised and pleased to know that the publication of the beautifully illustrated *Icones ad Floram Europæ* of Messrs. Alexis Jordan and E. Fourreau, has been resumed. It will be remembered that the latter author was killed during the siege of Paris in 1870; Jordan, however, continued to work steadily upon the work, and had intended to resume the publication; but death again intervened, not only in his case but in that of Hilarion Borel, to whom Jordan bequeathed the production of the work. The present instalment, superintended by M. Camille A. Jordan, comprises the completion of the second volume (plates 281–354) and a third volume (plates 355–500); the text is by Jordan. A large amount of matter and a hundred plates exist unpublished, but these will not be issued, as it is thought nothing should appear under Jordan's name which does not contain "l'expression définitive de sa pensée"; the plates and MSS. have been entrusted to the Société Botanique de France, and will be available for reference. The plates include critical species of *Saxifraga*, *Ornithogalum*, *Gladiolus*, *Pæonia*, *Ramondia*, *Scilla*, *Romulea*, *Aster*, *Narcissus*, *Pyrus*, *Brassica*, *Cyclamen*, *Dianthus*, *Vitis*, *Iberis*, *Quercus*, and *Smilax*, and are of great beauty.

The first number of the *Albany Museum Records*, which appeared in April, contains papers by Dr. Schönland on some South African species of *Aloe*, a list of South African species of *Crassula* described during recent years, and descriptions of a large number of new species of *Crassulaceæ*, *Anacampseros*, &c.

We learn from the *Gardeners' Chronicle* that Prof. Penzig is examining the herbarium of Gherardo Cibo, which has been found in the Bibliotheca Angelica at Rome. It was made before 1540, and is in a good state of preservation.

CAMPANULA PERSICIFOLIA L. IN BRITAIN.

By G. Claridge Druce, M.A., F.L.S.

The distribution of this species given in Nyman's *Conspectus Floræ Europææ*, p. 481, is as follows: "Scand. (exc. Norv. bor. Lapp.) Germ. Batav. Belg. Gall. Arrag. Catal. Ital. cont. Helv. Austr. Hung. Slavon. Transs. Banat. Serb. Bosn. Croat. Istr. Dalm. Herceg. Monten. Macedon. (r.) Thrac. (rr.) Thessal. (Olymp.) Ross. med. mer." So that its absence from Britain as a native plant is anomalous.

The places of growth, as given in some of the leading continental floras, are: "Prairies montagneuses de toute la France," Gren. Godr. Fl. Fr. ii. 420; "In nemoribus, silvaticis, dumetis regionis mont. Hispaniæ orientalis passim," Willk. & Lange, Prod. Fl. Hisp. ii. 293; "Bois montueux, rochers, bords des chemins creux," Wildeman & Durand, Prod. Fl. Belg. p. 737 (1899); "In sylvis," Gaud. Fl. Helv. ii. 154; "In sylvis præcipue montosis, in montosis præruptis inter virgulta," Koch, Fl. Germ. ii. 541; "Bois et taillis de la plaine," Bouvier, Flore des Alpes, p. 423; "In dumetis," Fl. Danica, t. 1087; "Crescit in sylvis pratisque," Reichenbach, Ic. Fl. Germ. xix. p. 118.

The first notice of it as a British plant is to be found in *The Herbarium Britannicum* of George Don, fasc. viii. (dated 1806) no. 180, where it is labelled, "*Companula persicifolia*, Fl. Dan. t. 1087, Bulliard, Herb. Fra. t. 367. This beautiful companula [*sic*] may now be regarded as an addition to the British Flora, as I have observed it in woods near Cullen in July, 1802, at which time it was in flower, and appeared to be indigenous. What convinces me the more of this is, that all the companulas of this species found in gardens in that neighbourhood were double-flowered. I also enquired diligently if ever it had been seen with single flowers in that country, but was uniformly answered in the negative. I may further observe that I have often seen the plant neglected and allowed to remain without culture for years, but could never observe any variation of its flowers. It may therefore be concluded that this plant is truly indigenous."

In the *English Flora*, i. 291 (1824), Smith writes: "In woods in Scotland. Near Cullen, Don. Mr. Don's specimens have a perfectly wild aspect." The figure in *English Botany* (t. 2773) was made from a specimen in Smith's copy of Don's fasciculus.

Watson (Cyb. Brit. ii. 141) gives "Area (15). Alien. In 'woods near Cullen, apparently indigenous' (Fl. Scot.). Although widely distributed in Scandinavia, it is to be feared that there is very slight ground for supposing this to be a native of Scotland; nor does it clearly appear whether the plant is still found in the neighbourhood, or was found there only some years ago."

Mr. F. Arnold Lees (in the Fl. West York. p. 315) mentions it as "a naturalised plant by the river Wharfe in ornamental grounds at Thorparch! S. Hailstone." Here the origin of the plant is quite evident, as it is in the locality mentioned in Balfour's *Flora of Edinburgh*, p. 79: "Bed of Esk, near Musselburgh. Introduced and not native." Prof. Traill, in his paper on Topographical Botany in Scotland (Ann. Scot. Nat. Hist. 1898, p. 231), considers it an escape in the counties of Dumfries, West, Mid, and East Perth; the Cullen locality (Banffshire) is not included.

The above history of *Campanula persicifolia* gives no sufficient authority for the inclusion of it among our native plants; though it would be well worth investigating the condition of it in Don's locality should the plant indeed still exist at Cullen.

I have now, however, to communicate a habitat where the species seems to have strong claims to being considered indigenous. It was found by the Rev. H. P. Reader, O.P., in July last, on dry slopes between Nailsworth and Dursley, remote from houses, amongst *Brachypodium pinnatum*, *Campanula glomerata*, *Blackstonia*, &c., at an altitude of about 700 ft. The flowers were blue in colour, and, with the exception of one plant that had three flowers, solitary. "The locality," writes Father Reader, "is at least two miles from houses and gardens. There is a fairly large quantity of the plant, so far as I have had time to explore at present. The plant looks, with its solitary or few flowers, unlike the robust garden form." The plant is the type with glabrous calyx, and not the variety *lasiocalyx* of Grenier and Godron. On the Continent it has a distinct gypsophilous tendency, although occasionally found on other soils. The above locality is, of course, on calcareous soil.

When one remembers that *Stachys alpina* is in the same area, although not actually near this spot, I think that it will be seen that the chances of this being a really native situation for the *Campanula* is strengthened, especially as its geographical distribution in Europe renders it also a likely plant to be indigenous in Britain. In connection with it one may mention that *Poa Chaixii* Vill. (*P. sudetica* Haenke) was found by me in Berks, on the border of Wilts, in a copse where there is strong reason to believe it to be indigenous, and I have been expecting to hear of its being found in Gloucestershire, where there are even yet large woodland districts practically unexplored.

Father Reader, it will be remembered, was the discoverer of the locality near Woodchester Park for the *Lycopodium* which was described as *complanatum*,* but is now by the majority of botanists considered to be a variety of *L. alpinum*; this, however, is nearly if not quite extinct in its Gloucestershire locality.

* See Journ. Bot. 1882, 321, t. 233.

ON THE BRITISH FORMS OF RHINANTHUS.

By Rev. E. S. Marshall, M.A., F.L.S.

Dr. Jacob von Sterneck, of Trautenau, Bohemia, was good enough last year to revise the yellow rattles in my herbarium—comparatively few, as I have not made a special study of them, though fairly representative, especially of the Scottish alpine plants. My reference-numbers are stated in all cases where they exist. He also very kindly gave me a copy of his *Monographie der Gattung Alectorolophus* (Vienna, 1901, Alfred Hölder), a detailed study of which has afforded the chief materials for this paper.

The only British collection revised by our author before publication was that of Mr. G. C. Druce, fortunately a rich and varied one. Mr. Druce has given a summary of the determinations in the *Annals of Scottish Natural History* and the *Irish Naturalist*, but without going much into detail.

This monograph, modelled upon Professor von Wettstein's works on *Euphrasia* and *Gentiana* (§ *Endotricha*), gives evidence of long and conscientious study; and I believe that the conclusions arrived at will, upon the whole, stand the test of time. But it appears pretty certain that a good deal still remains to be done, especially in the case of the North American and West Asiatic forms, which are still quite imperfectly known.

As regards nomenclature, Dr. von Sterneck's views are not likely to receive unqualified acceptance. The generic name *Rhinanthus* is rejected on quite arbitrary grounds. *Fistularia* L. (1735), the oldest undoubted name, which Wettstein retains, was superseded by *Rhinanthus* L. (1737); and this was adhered to in the *Species Plantarum* (1753). Dr. von Sterneck maintains that it cannot be used only for a part of the collective genus—most of the Linnean species having since been referred to other genera—and that *Rhinanthus* Pollich (1777) or Lamarck (1778) ought to be set aside as merely homonyms of Linné's *genus collectivum*. He accordingly prefers *Alectorolophus*, borrowed from Haller (1742) by Allioni (1785). Even here he is not consistent; for the original *A. hirsutus* All. is needlessly supplanted by the new (1895) and clumsy name *A. Alectorolophus* Sterneck. Moreover, this generic change is made notwithstanding the statement in Chabert's *Etude*, p. 428 (1899):—"J'ai prié M. de Candolle de me donner son avis. Après avoir étudié la question il m'a répondu: 'Haller qu'a suivi Allioni n'avait aucunement le droit, selon règles actuelles, de remplacer en 1742 par *Alectorolophus* (de Pline) le nom *Rhinanthus*, qui avait été donné en 1737 par Linné (dans son Genera) au *Crista Galli* de Rivinus.' Je conserverai donc le nom de *Rhinanthus*." This expert opinion is not lightly to be rejected; and although I shall quote our author's nomenclature to begin with, for convenience, this is not to be taken as an agreement with his conclusion.

The plan of the book is to treat separately the *segregates* (Sippen),

by which is meant permanent and fairly constant forms of somewhat unequal standing—several being frankly treated in the text as deserving varietal rather than specific rank. A valuable table is given at the end, in which the plants are arranged in order as follows:—Fifty-one *segregates*, besides two subspecies or subsegregates (recent), falling into forty-one species (prehistoric time), twenty-one *species collectivæ* (glacial period), six *sections* of tertiary times ("species Linneanæ dictæ"), and one (hypothetical) primitive species. Chapters vii. ("History of the development of the genus") and viii. ("Systematic view of the genus on the basis of phylogeny") are quite masterly, but an analysis of them would exceed my present limits. The six main sections above referred to are as follows:—*Æquidentati*, *Brevirostres*, *Inæquidentati*, *Anomali*, *Primigeni*, and *Minores*; of these, only *Inæquidentati* and *Minores* are represented in the British Isles. Points regarded as of special segregative value are these:—Seasonal dimorphism (*æstivales*, *autumnales*); valley-forms, forms of high mountains (*monticoli*); closed or open corolla-throat (*cleistolemus*, *anæctolemus*); calyx pubescent or glabrous; curved or straight corolla-tube; size, shape, and direction of the lobes (or teeth) of the upper lip, &c. The presence or absence of "intercalary leaves" is a subject to which, apparently, no attention has been hitherto paid by British botanists.

Alectorolophus major Reichb. (1830). *Rhinanthus major* Ehrh. (1791).

"Caulis 20–50 cm. altus, nigro-striolatus, alternatim parce hirsutus, ceterum glaber,* *internodiis elongatis*, simplex vel ramosus, ramis oblique adscendentibus, caule brevioribus, *pari foliorum intercalarium unico vel nullo instructus. Folia caulina internodiis duplo breviora, ovato- vel oblongo-lanceolata, in apicem paulo attenuata*, crenato-dentata, *dentibus subadpressis*. Bracteæ glabræ, pallidæ, exceptis duobus paribus infimis, foliis caulinis similibus, late triangulares, in apicem productæ, calycem superantes, *dentibus inferioribus profundis*, 0·5 cm. longis, anguste-triangularibus, *non aristatis*, *ad apicem bracteæ gradatim decrescentibus*, *superioribus* remotis, inæquale-triangularibus, brevibus, *adpressis*. *Calyx glaber*, in margine parce scabridus, dentibus in margine minime glandulosis. Corolla 2 cm. longa, tubo paulo sursum curvato, dente labii superioris horizontali, 0·2 cm. longo, conico, subobtuso, violaceo, labio inferiore erecto, superiori adpresso, itaque faucem occludente. Semina ala membranacea, 0·1 cm. lata prædita, vel exalata."

This is divided by Sterneck into (*a*) subsp. *eumajor*: "Semina ala membranacea, 0·1 cm. lata prædita, flora latiora. Floret mense Junio"; and (*b*) subsp. *apterus*, *R. Reichenbachii* Drejer (1838), *pro parte*, *R. major* var. *apterus* Fries (1846): "Semina exalata, folia angustiora. Floret paulo serius quam species præcedens."

Of the type I possess no specimen. Our author has seen examples in herb. Druce from Anglesey, Richmond (Yorks), Arbroath

* The italicized parts of the descriptions are those which the monographer considers to be of special importance.—E. S. M.

and Eddlesborough in Scotland; also in herb. Delessert (Geneva) from Thirsk. Mr. Beeby records it from the Shetlands, and Mr. C. E. Salmon from Inchnadamph, W. Sutherland (the latter plant I have examined; no fruit was present). It is found as far south as N. Somersetshire; there are specimens in Rev. R. P. Murray's collection from marshy pastures on Glastonbury Moor, near Shapwick Station—evidently a natural habitat—which I saw some years ago, and believe to be rightly named.

Fries divides the species, in *Nov. Fl. Suec. Mantissa*, iii. pp. 60–2 (1843), which Dr. von Sterneck has apparently overlooked, into three forms: "Var. *platypterus*, scaber, seminum ala lata, semen subæquante"; "*stenopterus*, subpubescens, ala seminum angustissima"; and "*apterus*, sublævigatus, seminibus exalatis, arillo in ambitu incrassato rotundato-obtuso longitudinaliter rugoso-striato." Babington records the first of these from Hastings. Fries, who plainly regarded it as the type, states that it is partial to "prata fertiliora et nemora"—just such situations as Sterneck assigns to his type ("wiesenbewohnend"); whereas he found *stenopterus* "in agris fertilibus quidem, sed solo duriori magisque urente, v. c. rigide-argillaceo et calcareo. Hoc vero aliis locis aliter se habere potest." Now the broad wing of *platypterus* (not mentioned in the monograph) is unique in the genus, all forms of which are described as having shortly-winged seeds (1 mm.), with the exception of two wingless subspecies—*A. apterus* and *A. buccalis*. *A. buccalis* = *R. buccalis* Wallroth (1842) is restricted to cornfields; and Sterneck considers (p. 143) that it arose through gradual selection of the individuals better equipped against destruction by farming operations, whereas the original type remained constant in meadows. This I believe to be approximately true of *R. major* var. *apterus*. Fries says, "Præcipue inter segetes occurrit"; and I have only met with it in or near cornfields. Probably it is not uncommon in the low-lying counties of E. Scotland near the coast. Much of this corn-land has been reclaimed by drainage, and I regard it as an original native, now modified, rather than as an introduced plant; the more confidently, as Fries again remarks that it grows chiefly "in provinciis macris montanis et occidentalibus"; the Danish (Jutland) specimens mentioned in the monograph thus forming a connecting link with the Swedish localities. Fries also states that Sonder sent it to him from N. Germany.

Dr. von Sterneck writes (p. 70):—"In England [this evidently includes Scotland], whence I have seen several specimens, *A. major* seems to occur in a rather peculiar form, for the specimens are somewhat more bushy, the leaves narrower and more acutely dentate; thus they bear a very considerable resemblance to *A. Borbásii*, described from Hungary."

A. MINOR Wimm. & Grab. (1829); *A. parviflorus* Wallr. (1822). *R. minor* Ehrh. (1791); *R. Crista-galli* L. (1753), *pro parte*. It will be noticed that Sterneck has rejected the original name under *Alectorolophus*.

"Caulis 10–50 cm. altus, viridis aut nigro-striolatus, alternatim parce hirsutus *internodiis elongatis*, simplex vel ramosus, ramis

oblique adscendentibus, caule brevioribus, *supra ramis supremis aphyllus*. Folia caulina internodiis breviora, oblongo-lanceolata, vel lanceolata, subobtusa, superiora interdum in apicem paulo attenuata, crenato-dentata, dentibus subadpressis. Bracteæ glabræ, nigro-virides, exceptis duobus paribus infimis, foliis caulinis similibus, triangulares, in apicem paulo productæ, calycem superantes, dentibus inferioribus triangularibus minus profundis, ad apicem bracteæ gradatim sed paulo decrescentibus, superioribus remotis, brevibus, adpressis. *Calyx* minor excepta margine, minime scabrida, *glaberrimus*. *Corolla* 1·5 cm. longa, *tubo recto*, *dente labii superioris minimo rotundato*, albo vel rarius violaceo,* labio inferiore paulo patente, superiori non adpresso, itaque fauce fere aperta. *Stylus demum curvatus*. Semina ala membranacea, 0·1 cm. lata prædita. *Floret* primus *mense Majo et Junio*."

Our author remarks:—"I have already pointed out in Oesterr. Bot. Zeit. p. 299 (1895), that Linné certainly included this segregate under his *R. Crista Galli*, but that he also comprehended under this name another segregate (probably *A. Alectorolophus*, or perhaps *A. major*), and (*e. g.* in Fl. lappon. p. 248) expressly stated that he combined both under one name, and would not undertake to separate them. We are, therefore, not justified in applying this Linnean name to the present segregate." With this conclusion I fully agree, mainly on the ground that a specific name, to be of any real value, should be at least precise.

"The variability of this segregate is very considerable. Many of these varieties have been named; but the majority—thank goodness!—have remained unnamed." Want of space forbids my giving the interesting remarks which follow in full; it is enough to say that the monographer does not retain any as distinct, apart from those ranked as segregates.

"*A. minor* is probably the most widely spread, and thus the commonest segregate of the whole genus. It is a typical meadow-plant, both in the damp (and even swampy) lowlands and in the dry short-turfed pastures of the higher mountains. As a rule it occurs in great abundance." This every British botanist can confirm from his own experience. It seems to be found throughout our islands; I have a specimen collected by Mr. Beeby on Burrafirth Cliffs, Unst. There is a boreal form noticed by Sterneck, concerning which it may be well to give the following extract:—"I should have liked to separate another group from *A. minor*, i.e. the specimens from Lapland, Norway, Iceland, Greenland, and Newfoundland, because I feel that these specimens, geographically separated as they are from the rest of *A. minor*, represent a special independent type. They all have one uniform character—an almost unbranched, low-growing stem, lengthened internodes, broadly elliptic leaves, and bracts produced into a point, so that they often far exceed the flowers. Now, these peculiarities are also exhibited by *A. borealis*, which is distinguished only by its hairy

* "Var. *vittulatus* Gremli, Excurs. Fl. d. Schweiz iv. p. 320 (1881) = *A. fallax* of most recent authors, non Wimmer."

calyx. Again, from a geographical point of view, a certain congruity in the area occupied is perceptible. However, all these points are to be found at times, in fact frequently, in the common *A. minor* of our own meadows; so that, from a morphological point of view, a separation of the two is impracticable." I have sometimes found the bracts to be of a decidedly *yellowish*-green; and, with us, the upper corolla-lobes appear to be usually violet, whereas on the continent they are more frequently white.

The var. *fallax* Wimm. & Grab. (1829) must be expunged from our list for the present, though the true plant (*R. major* × *minor*) will probably be found where the parents grow near one another, as in E. Scotland. The fertility of its pollen is stated at from 64 to 75 per cent., whereas in the large-flowered form of *A. minor*, which simulates it, this is never below 93 to 95 per cent. A good deal of our supposed *fallax* is *R. stenophyllus*.

A. RUSTICULUS Sterneck (1901). *R. minor β rusticulus* Chabert and *R. Perrieri* Chabert (1899).

"Differt ab *Alect. minore caule humili, 5–10 cm. alto, simplici, paucifloro, calycibus fructiferis atro-violaceis*, florendi tempore mense Julio."

This delicate little plant was previously known from a very few stations in Savoy, the Maritime Alps, Tyrol, and Iceland. Its discovery by Mr. W. A. Shoolbred and myself in wet ground on the south side of Loch Stenness, Mainland, Orkney, barely 20 feet above sea-level, on July 13th, 1900, affords a connecting link. Very few specimens were collected, as most of the plants were in bud only (no. 2442).

It should be found in the Shetlands and on the north coast of Scotland. Of my own four herbarium specimens, two are 1-flowered and two 2-flowered; all have erect, rather closely serrate, narrow leaves, hardly more than a line across at the broadest part, and at most three-quarters of an inch long; those of the lower half of the stem having already dropped off.

Dr. von Sterneck considers this segregate as uncommonly near to *A. minor*, and especially to its "monticole" parallel-form. No transition-forms connecting it with the super-species have hitherto been observed, but their discovery is probable. The low-lying station in Orkney, as compared with its alpine ones in South Europe, is not at all surprising when the sub-arctic climate is taken into account. Chabert's *R. Perrieri* (from near Modane in Savoy) was described as a species only on the ground of the corolla-tube becoming elongated during the course of flowering. This alleged character, however, Sterneck could not confirm after examining the original authentic specimens; and, if it did exist, he would attach no distinctive importance to it, as being merely a means of self-fertilisation in the absence of insect visitors, of which all the segregates are capable.

A. stenophyllus Sterneck (1895). *R. minor* var. *angustifolius* Fr. (*Mantissa*, iii. p. 62, 1843); var. *angustifolius* Koch (*Syn.* ii. p. 626, 1844), *non R. angustifolius* Gmelin (1806). *R. minor* var. *steno phyllus* Schur (1866).

There can, I think, be no doubt, from Fries's description, that the present plant was intended. It must bear the specific name of *R. stenophyllus*, the earlier varietal name being preoccupied.

"Caulis 20–50 cm. altus, viridis aut nigro-striolatus, alternatim parce hirsutus, *internodiis multis, brevibus* vel paulo elongatis, e parte media ramosus, ramis arcuato-adscendentibus, virgatis, caule subæquilongis, *duobus vel tribus foliorum paribus intercalarium instructus*. Folia caulina internodiis longiora vel subæquilonga, *lineari-lanceolata*, acuta, crenato-dentata, dentibus subadpressis vel rarius patentibus, folia inferiora in planta florente sæpius jam destructa. Bracteæ glabræ, nigro-virides, exceptis duobus paribus infimis, foliis intercalaribus similibus, triangulares, in apicem paulo productæ, calycem æquantes, dentibus inferioribus triangularibus, subulatis, non aristatis, ad apicem bracteæ gradatim sed paulo decrescentibus, superioribus remotis, brevibus, subadpressis. Calyx *minor*, excepta margine minime scabrida, *glaberrimis*. Corolla 1·5 cm. longa, *tubo recto, dente labii superioris minimo, rotundato*, albido vel rarius violaceo, labio inferiore paulo patente, superiori non adpresso, itaque fauce fere aperta. *Stylus demum curvatus*. Semina ala membranacea, 0·1 cm. lata prædita. *Floret mense Julio et Augusto*." (Fries remarks that his var. *angustifolius* opens its first flowers when *R. minor* is already shedding its seeds all over the meadows below.) This plant, though as a rule it has much the same distribution as *R. minor*, seems to be much scarcer, and has not been observed in N. America, Greenland, Iceland, N. Scandinavia, or Russia. It "represents the typical autumn form of *A. minor* . . . but the presence of intercalary leaves always offers a more certain mark of differentiation from *A. minor*."

This species was first observed in Britain by Mr. F. J. Hanbury and myself in 1890 (no. 83) near Tain, v.-c. 106 E. Ross, at once striking us as distinct. When revisiting the town next year, I found it to be remarkably plentiful on heaths, &c., in the neighbourhood; and Prof. Lange afterwards correctly determined it as *R. minor* var. *angustifolia* Koch. I have also gathered it near Fort George, 96 E. Ross, associated with *R. major* var. *apterus*: about Killin, 88 Mid-Perth (the form with white-lobed upper corolla-lip, which appears to be rare in Britain); on the downs above Sutton, 13 W. Sussex (no. 2584); in meadows near Clonbur, W. Galway; and on the Bog of Lynn, near Mullingar, Westmeath (no. 1421). Mr. C. E. Salmon has collected it at Inchnadamph, 108 W. Sutherland; and Sterneck has seen examples from the following additional stations in herb. Druce:—Boat of Garten (96 E. Inverness), Glen Spean (97 W. Inverness), 105 W. Ross, Banbury (23 Oxford), Lough Owel (Westmeath), and Glengariff (Cork); so that its distribution with us is a wide one. I may mention that my herbarium specimens are mostly branched from quite near the base of the stem.

A. MONTICOLA Sterneck (1901). *R. minor monticola* Lamotte *in schedis* (1881).

"Differt ab *A. stenophyllo caule humili* 10–20 cm. alto, *internodiis inferioribus brevissimis et plurimis*, internodiis intercalaribus elongatis

itaque magnam differentiam formantibus, *ramis multis, sed omnibus abortivis*, foliis caulinis linearibus, sæpius recurvatis."

This requires a name under *Rhinanthus*, and must be called *R. monticola*, unless placed as a variety of *R. stenophyllus*, to which Sterneck remarks that it comes very near, only differing in those points which characterize the monticole or mountain series. He adds, however, that the English [*i. e.* Scottish] examples are more sparingly branched than the continental ones, and much resemble *A. Drummond-Hayi*, which occupies much the same region, and is probably more closely connected with it than is *A. stenophyllus*.

I gathered this in July, 1888, by the stony footpath in Glen Doll, Clova, 90 Forfar, at 1000–1200 feet, being struck by the peculiar dull treacly-brown colour of the flowers. A dwarf specimen from the low coast near Tain is also placed here. Mr. Druce has collected it at Munlochy in Cromarty, and three other stations in N. Scotland; so that it may prove to be fairly frequent when better known. Otherwise it is on record only from one French and one German locality.

A. BOREALIS Sterneck. *R. minor* var. *Drummond-Hayi* F. B. White !, *pro parte*.

"Caulis 5–30 cm. altus, non nigro-striolatus, alternatim dense villosus, *internodiis plus minus elongatis, semper simplex.* Folia caulina internodiis breviora, *inferiora ovata*, obtusa, *profunde crenata*, superiora lanceolata in apicem attenuata, dentata, *dentibus acutis, subpatulis.* Bracteæ scabridæ, virides, exceptis duobus paribus infimis, foliis caulinibus similibus, triangulares in apicem longum productæ, *calycem superantes*, dentibus inferioribus longioribus, superioribus remotis, paulo brevioribus, patulis. *Calyx undique pilis brevibus, unicellularibus, nunquam glanduliferis hirsutus.* Corolla 1·5 cm. longa, *tubo recto, dente labii superioris minimo, rotundato*, labio inferiore paulo patente, superiori non adpresso, itaque fauce fere aperta. *Stylus demum curvatus.* Semina ala membranacea, 0·1 cm. lata prædita. *Floret mense Julio.*"

As a species, this must be called *Rhinanthus borealis*. Dr. von Sterneck remarks that, as it is a northern plant, he has only had a limited supply of material available; so that further critical notes are desirable in this and similar cases. "Its difference from *A. minor* consists mainly in the densely hairy calyces and stem, which make it easy to recognize. In the specimens from Cape Farewell the small hairs are much reduced, and can only be perceived through a lens." He considers it to belong to the monticole-æstival series. Some of my own specimens break down the difference in size and robustness which he had noticed between the American forms submitted to him and the dwarfer, more slender ones from Scotland. A plant from Aonach Beg is a full foot high, with a strong stem, broad-based (up to $\frac{5}{8}$ inch) leaves and bracts, and the largest fruiting-calyces of any in my collection. In the table at the end of chapter viii. (p. 147), where *A. minor* is ranked as a *species collectiva*, divided into two species: *A. minor* with a var. *rusticulus*, and *A. stenophyllus* with a var. *monticola*, *A. borealis* is also

treated as a *species collectiva*, divided into three species: *A. borealis*, *A. arcticus*, and *A. Drummond-Hayi*.

Our author had seen specimens, previous to publication, from Unalaska Island, N.W. America, and from Cape Farewell in Greenland (having examined no yellow rattles at all from British North America, he expects that connecting stations will be found); also (herb. Druce) from Ben Lawers, Ben Heasgarnich, and two other localities in the Grampians. I believe it to be commoner in Scotland than *Drummond-Hayi*, in company with which it sometimes grows; and it should occur in the Lake District, as well as on the Snowdon group of mountains. My own gatherings, from mica-schist and granite, are as follows, but I have certainly seen this or *Drummond-Hayi* on several other hills:—Ben Laoigh, 88 Mid-Perth (my authentic specimens of *minor* var. *Drummond-Hayi* from thence, and Mr. Druce's from Ben Lawers, are referred to *borealis*); Ben-a-Chroin, Glen Falloch, 87 or 88 West or Mid-Perth, c. 3000 feet; Ben Chaisteil, near Tyndrum, 98 Argyle, c. 2000 feet; Aonach Beg, 97 W. Inverness, c. 2500 feet; and north-east slopes of Ben Hope, 108 W. Sutherland, above 2000 feet. It appears, therefore, to be a distinctly *alpine* plant in Britain.

A. Drummond-Hayi Sterneck (1901). *A. grœnlandicus* var. *Drummond-Hayi* Ostenfeld, *Phanerog. and Pteridoph. of the Faeröes*, p. 55 (1901), *pro parte*. *R. minor* var. *Drummond-Hayi* F. B. White, *Scottish Naturalist*, 1886, p. 1886; ut videtur, *pro minori parte*.

"Differt ab *A. arctico caule tenui et gracili*, 10–15 cm. alto, *ramis minimis semper abortivis*, *foliis anguste linearibus*, floribus paucis."

This makes it necessary to quote the description of *A. arcticus* Sterneck (1901):—"Caulis 25 cm. altus, *robustus*, non nigro-striolatus, alternatim hirsutus, internodiis multis, brevibus, *ex parte media ramosus*, *ramis multis caule paulo brevioribus*, *duobus vel tribus foliorum paribus intercalarium instructus*. Folia caulina internodiis longiora, *anguste-lanceolata*, in apicem attenuata, acuta, dentata, dentibus acutis, subpatulis, folia inferiora in planta florente jam destructa. Bracteæ scabridæ, exceptis duobus paribus infimis, foliis intercalaribus similibus, triangulares, in apicem longum productæ, calycem superantes, dentibus inferioribus longioribus, superioribus remotis, paulo brevioribus, patulis. *Calyx undique pilis brevibus*, *unicellularibus*, *nunquam glanduliferis hirsutus*. *Corolla* 1·5 cm. longa, *tubo recto*, *dente labii superioris minimo*, *rotundato*, labio inferiore paulo patente, superiori non adpresso, itaque fauce fere aperta. *Stylus demum curvatus*. Semina ignota. Floret mense Augusto." It is only known from one station—Ocean Cape, Yakutat Bay, Alaska, N.W. America.

Sterneck remarks that *A. Drummond-Hayi* clearly belongs to the autumnal series by its short internodes, narrow leaves, and the regular presence of intercalary leaves. The calyx-pubescence is similar to that of *A. borealis*, which shows that the two are closely related, as seasonally dimorphic segregates of one parent-form. White's original description does not take these differences of habit into account, laying stress merely upon the difference of the calyx-

clothing [from *R. minor*]. As a segregate, it should bear the name of *Rhinanthus Drummond-Hayi.*

This plant is known only from Scotland, where it seems to be less frequent than *R. borealis.* Mr. Druce's specimens are from Kinlochewe, 105 W. Ross, and Clova, 90 Forfar. My own are from Glen Doll, Clova (*legit* E. F. Linton), and Aonach Beg, 97 W. Inverness, c. 2500 feet; one of these latter being about 20 cm. in height, and thus exceeding Sterneck's limit.

It now remains to forecast what other forms may with more or less probability be expected to occur within the limits of our flora. This task I attempt with much diffidence, but it may have a certain value in directing British botanists' attention to the subject.

1. *Rhinanthus Alectorolophus* Poll. (1777). *A. hirsutus* All. (1785). Known as far west as Belgium and Picardy; but its head-quarters are in Central Europe, with an extension into the northern half of Italy. The subspecies *R. buccalis* Wallr. (1842) being confined to cornfields, especially rye crops, is more likely to occur as a casual than as a native in Britain.

2. *R. Heribaudi* Chabert (1899); *R. goniotrichus* Chabert (1900). *A. mediterraneus* Sterneck (1901). This is found in France, chiefly south-eastwards, but appears to occur in Brittany as well as in the Pyrenees, so that it may possibly be detected in southern England or south-west Ireland, and more probably in the Channel Islands. It has very large bracts, deeply toothed at the base; the calyx partly clothed with very short straight hairs; the corolla-tube slightly curved above; the violet lobes horizontal, 2 mm. long, conical, subobtuse; and the lower lip adpressed to the upper, thus closing the throat.

3. *R. montanus* Sauter (1857); *R. major β angustifolius* Koch (1844). *A. serotinus* Schönheit (1866); *A. montanus* Fritsch (1898). Distribution almost as in *R. major*, but hitherto unknown in Britain, France, and Asia Minor. It is an autumnal segregate, parallel to that species, but glabrous-stemmed, with many short internodes, arcuate-ascending branches which equal or exceed the main stem; linear-lanceolate leaves longer than the internodes; two or three pairs of intercalary leaves; narrowly triangular bracts, and smaller flowers (1·8 cm.). This is more likely to be discovered in E. Anglia than elsewhere. It flowers in August and September.

4. *R. grænlandicus* Chabert (1899). *A. grænlandicus* Ostenfeld (1891). Found in Labrador and Greenland; probably also in Iceland. This, judging from the analogy of *Euphrasia latifolia* Pursh, is by no means unlikely to grow in N.W. Scandinavia, the Faeröes, Shetlands and Orkneys, and on the extreme northern coasts of Scotland. It is described as having a stout stem, bifariously hairy, without black striæ, with long internodes, simple, or very rarely producing short, always abortive branches; stem-leaves falling short of the internodes, rather fleshy, ovate-oblong, subacute, coarsely dentate, the teeth few, deep, acute, very spreading; calyx large or very large, quite glabrous but for the scabrid edges; flowers much as in *R. minor.* Dr. von Sterneck calls it "a very marked type among the *Minores* section."

5. *R. Kyrollæ* Chabert (1899). *A. Kyrollæ* Sterneck (1901). A North American species, the distribution of which is imperfectly ascertained; but it is known in western U.S.A. from Washington State, and in the east from Maine, New Hampshire, and Maryland. Since the North American *Eriocaulon septangulare*, *Spiranthes Romanzoffiana*, and *Naias flexilis* are undoubtedly native in Ireland, while the evidence in favour of ranking *Sisyrinchium angustifolium* as such continually grows stronger, it is just possible (though, of course, unlikely) that it may have survived there from preglacial times. This is a tall plant (sixteen to twenty-eight inches), usually simple, sometimes slightly branched; the branches short, obliquely ascending. Cauline leaves elongate-lanceolate, narrowed at both ends, with acute, rather speading teeth. Calyx covered, especially on the upper surface, with minute, one-celled, eglandular hairs. Corolla very small (8–9 mm.).

THE MARINE ALGÆ OF THE SHETLANDS.

By F. Börgesen (Copenhagen).

Our present knowledge of the Algal vegetation of the Shetlands is comparatively very slight. In his *Flora of Shetland* (1845) Edmondston gives a list of the algæ found by him, but no newer contributions have been made so far as I know, and Mr. Batters tells me that according to his knowledge no further notes exist on Shetland algæ. The late Mr. Traill once visited the islands and sent Mr. Batters some algæ gathered there, but they were all common species.

I had for a long time been wishing to visit the islands to investigate the algal vegetation for the purpose of comparing it with that of the Færöes, which I have been studying during the last years,* and last summer I was fortunate enough to visit the islands on my way to the Færöes with the 'Beskytteren,' the Færöese cruiser, as the Danish Marine Department permitted the cruiser to touch at these islands.

As may have been anticipated, the algal vegetation of these two archipelagos was very similar; but as I only made a very short stay on the Shetlands, I have naturally gained only a rather superficial knowledge of the algal flora of the islands in question.

We arrived at Lerwick late in the afternoon of the 14th of July, stayed there the next day, and left early the following morning, and went through Yell Sound with the pilot on board. Besides the sheltered place which I had an opportunity of investigating near Lerwick, I wished particularly to examine an exposed locality on the west coast. Unfortunately I did not quite succeed. It was dense fog and rain when we left Lerwick; by and by the wind

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* See "The Marine Algæ of the Færöes," in the *Botany of the Færöes*, Part II. Copenhagen, 1902.

freshened, and when we approached the further end of Yell Sound, a rather heavy surge made all landing on the west coast impossible. I was therefore obliged to content myself with examining a smaller island, Muckle Holm, situated near the further entrance to the Sound. We succeeded in landing here, on the south-west side, in spite of the surge. The algal vegetation here was distinctly that of the exposed coast, and agreed very closely with that of the Færöese coast. From this island we went to a smaller sheltered bay, Burra Voe, where we stopped to put the pilot ashore, and where I, consequently, again had an opportunity of examining—though briefly—another sheltered locality, and then we left the islands.

I had been particularly anxious to compare the Fucus-vegetation of the two archipelagoes. It is strange that *Fucus serratus* does not occur in the Færöes, as it is found in Iceland, and is very common on the west coast of Norway and also in the Shetlands. *F. inflatus*, on the other hand, is very common in the Færöes as well as in Iceland, and on the north coast of Norway,* and therefore I supposed that this alga was to be found in the Shetlands also. This supposition was strengthened by my finding it growing abundantly on stones in Lerwick Harbour, but in spite of a very close search I did not find it in any other place, neither east of Lerwick outside the fjord, nor on Bressay, where I visited some islets and a larger sheltered bay behind them, nor in Burra Voe. I also searched in vain for *F. inflatus* f. *disticha* (L.) Bórges. on Muckle Holm, though in a similar locality in the Færöes this form would undoubtedly have been met with, as being characteristic of the exposed coast of the latter place. Judging from the above, I do not think that *F. inflatus* can be very common in the Shetlands.

Regarding the algal vegetation of the sheltered localities here, as elsewhere, the *Fucaceæ* occurring between tide-marks characterize the vegetation. On the above-mentioned rocks opposite Lerwick on Bressay I found *Porphyra umbilicalis* on the side of the rocks facing the fjord, slightly above as well as slightly below high-water mark, in the latter place intermixed with *Pelvetia canaliculata;* and below this *Fucus spiralis* was met with, and then *F. vesiculosus*, and below this *F. serratus*, which grows slightly above and below high-water mark. On the side of the rocks facing the small sheltered bay I found *Pelvetia canaliculata* growing uppermost, below that *Fucus spiralis*, then *Ascophyllum nodosum* (with *Polysiphonia fastigiata*) and *F. vesiculosus*, and below these, near low-water mark, *F. serratus;* below the latter followed again the usual algal vegetation of such sheltered localities with gravelly and sandy bottoms, and sometimes interspersed with large stones, *viz.* nearest to the shore several species of *Enteromorpha*, and large bushes of *Ectocarpus littoralis*, &c., and further out large specimens of *Chorda Filum* with numerous epiphytes, *Laminaria saccharina*, *L. digitata*, &c.

* It is very interesting that Wille has discovered the alga in Kristianiafjord (*cfr.* Simmons, "Einige Algenfunde bei Dröbak," *Botaniska Notiser*, 1898, p. 117).

In Burra Voe I found an almost identical Fucus-vegetation; here the shores were very flat, and the Fucus-vegetation, especially *Ascophyllum nodosum* and *Fucus serratus*, occurred widely dispersed on the almost horizontal rocks; here, also, *Halidrys siliquosa* grew abundantly near low-water mark.

On the more exposed Muckle Holm I found no *Fucus*; but on its almost vertical or sloping rocks I observed, from the summit downwards, *Porphyra umbilicalis*, *Urospora penicilliformis*, and *Bangia fuscopurpurea*, *Polysiphonia urceolata* and *Acrosiphonia*, sp.; furthermore *Gigartina mamillosa* and *Corallina officinalis* intermixed with *Lomentaria articulata*. At about extreme low-water mark I found *Laminaria digitata* f. *stenophylla* and *Alaria esculenta*, and further down *Laminaria hyperborea*, the stems of which were covered with several epiphytes, especially a quantity of *Ptilota plumosa*.

The only opportunity I had of dredging in deeper water was in Lerwick Fjord, a little to the south-east of the town. Here I found, in 8 to 10 fathoms of water, large societies of *Laminaria hyperborea*. As usual, numerous epiphytes grew on the stipes of the latter, viz. *Polysiphonia urceolata*, *Lomentaria clavellosa*, *Ptilota plumosa*, *Delesseria alata*, *D. sanguinea*, *D. sinuosa*, *Derbesia marina*, *Dermatolithon macrocarpum* f. *Laminariæ*, *Nitophyllum laceratum*, *Euthora cristata*, &c.; here large specimens of *Laminaria saccharina* f. *bullata* also occurred; I did not find any *Laminaria* with hollow stipe.

The following list of the Shetland algæ contains, besides the algæ mentioned in Edmondston's *Flora of Shetland*, those found by me. Though incomplete, it adds a little to the knowledge of the composition of the algal vegetation of these islands.

It is to be hoped that these islands will soon be more thoroughly investigated as regards their algal vegetation, the latter being of great importance for the study of the algal vegetation of the Færöes, Iceland, and adjacent islands.

I have put an (E.) after the names of the algæ found by Edmondston, and have given the name used by him wherever this differs from that now in use.

Cyanophyceæ.

Dermocarpa prasina Born.—On *Polysiphonia fastigiata*. Burra Voe.

Calothrix confervicola Ag. (E.).

Chlorophyceæ.

Prasiola crispa (Lightf.) Menegh. subspec. *marina* Bórgesen in "Marine Algæ of the Færöes," p. 482 (*Botany of the Færöes*. Part II.). The greater part of the examined material was in the *Hormidium* (*Ulothrix radicans*) stage, with rather numerous rhizoids, often two together. But there also occurred threads in which the cells were divided in more than two directions (*Gayella* stage); a few *Schizogonium*-like threads were found intermingled. It occurred quite in the same way as in the Færöes, several feet above high-water mark on steep rocks covered with dark crusts of lichen (*Verrucaria*). Found to the south-east of Lerwick, on a promontory at the entrance to Lerwick Fjord.

Ulvella fucicola Rosenv.—On *Fucus inflatus*. Lerwick.

Enteromorpha Linza J. Ag. (*Ulva Linza* E.)—*E. intestinalis* Link (*Enteromorpha vulgaris* E.) doubtless includes several varieties and species, e. g. *E. clathrata;* but as his description does not make this quite clear, in the present list I have recorded *E. intestinalis* only.

Ulva Lactuca (E.).

Ulothrix flacca Thur. (*Lyngbya Carmichaelii* E.).

Endoderma Wittrockii (Wille) Lagerh.—Found growing in the cell-wall of *Elachista fucicola*. Burra Voe.

Urospora mirabilis Aresch.—Muckle Holm.

Chætomorpha ærea Kütz. (*Conferva ærea* E.).—*C. tortuosa* Kütz. (*Conferva tortuosa* E.).

Rhizoclonium riparium (Roth.) Harv. (*Conferva implexa* E.).

Cladophora rupestris (L.) Kütz. (*Conferva rupestris* E.).—*C. Hutchinsiæ* Harv. ? (*Conferva diffusa* E.).

Spongomorpha, sp. (*Conferva uncialis* and *C. lanosa* E.).

Acrosiphonia sp. (*Conferva arcta* and *C. centralis* E.).

Bryopsis plumosa (Huds.) Ag. (E.).

Derbesia marina (Lyngb.) Kjellm.—The specimens have almost ripe sporangia. With regard to their size and form, and how far they, on the whole, agree with the Færoëse and Finmark plants, I must refer to my remarks in my paper on the Færoëse algæ. Mr. Batters has kindly sent me a specimen from England (Swanage) of what he calls *Derbesia tenuissima* Crouan. The English specimens not bearing fully ripe sporangia, appear to be very like my Shetland and Færoëse specimens. As in the two latter, so also here, there usually occurs one short cell in the stalk of each sporangium, and its form is just like that of the others, only a little longer, *viz.* long. = about 200 μ; lat. = about 100 μ. Found at a depth of about six fathoms, epiphytic on the stem of *Laminaria hyperborea*, where it occurred as a short cushion about $\frac{3}{4}$ in. high. Lerwick.

Phæophyceæ.

Desmarestia viridis (Müll.) Lam. (*Dichloria viridis* E.).—*D. aculeata* (L.) Lamour. (E.).—*D. ligulata* (Lightf.) Lamour. (E.).

Dictyosiphon fœniculaceus (Huds.) Grev. (E.).

Phyllitis fascia (Müll.) Kütz. (*Laminaria fascia* E.).

Scytosiphon lomentarius (Lyngb.) J. Ag. (*Chorda Lomentaria* E.).

Asperococcus fistulosus Hook. (E.) = *A. echinatus* Grev. *cfr.* Batters, Catalogue, p. 28.—*A. bullosus* Lamour. (*A. Turneri* E.).

Ectocarpus siliculosus (Dillw.) Lyngb. (E.). — *E. fasciculatus* (Griff.) Harv. On *Rhodymenia palmata*. Burra Voe.—*E. tomentosus* (Huds.) Lyngb. (E.).—*E. littoralis* (L.) Lyngb. (E.).

Isthmoplea sphærophora (Harv.) Kjellm. (*Ectocarpus sphærophorus* E.).

Myriotrichia clavæformis Harv. (E.).

Elachista fucicola (Vell.) Aresch. (E.).—*E. scutulata* (Smith) Duby. (E.).

Sphacelaria cirrhosa Ag. (E.).—*S. furcigera* Kütz. Sterile, but

with propagula. Found on *Laminaria hyberborea* at a depth of about six fathoms. Lerwick.

Chordaria flagelliformis (Müll.) Ag. (E.).

Mesogloia vermiculata (Engl. Bot.) Le Jol. (*Helminthocladia vermicularis* E.).

Leathesia difformis (L.) Aresch. (*Corynephora marina* E.).

Chorda filum (L.) Stackh. (E.).

Laminaria saccharina (L.) Lam. (E.) f. and *Phyllitis* (*Laminaria phyllitis* E.).— *L. digitata* (L.) Lam. (E.).— *L. hyperborea* (Gunn.) Fosl. (*L. Cloustoni* E.). In his work *Ueber die Laminarien Norwegens* Foslie has, as it appears to me, fully proved that this alga ought to bear Gunner's name *L. hyperborea*, and not the far newer *L. Cloustoni* Edm.

Saccorhiza polyschides (Lightf.) Batt. (*Laminaria bulbosa* E.).

Alaria esculenta (L.) Grev. (E.).

Cutleria multifida Grev. (E.).

Fucus inflatus (L.) M. Vahl.—Well-developed, typical specimens, agreeing exactly with my Færoëse specimens referred to f. *edentata* (De la Pyl.) Rosenv., occurred abundantly near Lerwick. It grew here at about low-water mark on the quay itself, as well as on stones opposite to it; but in spite of a very close search I did not succeed in finding it anywhere else, neither to the south-east of Lerwick, nor in the sound near Bressay, nor on Burra Voe, nor on Muckle Holm. If further investigations prove that it occurs only at Lerwick on the quay, and on the stones conveyed thither, we should be justified in thinking that it must have been introduced.

With regard to the var. *inflatus* mentioned by Edmondston under *Fucus vesiculosus*, Mr. Batters kindly writes to me that "*F. vesiculosus* var. *inflatus* of Edmondston's Flora is not the *F. inflatus*, but in all probability only a not uncommon form of *F. ceranoides* with the ends of the branches much enlarged and swollen with air, all such specimens being referred by our earlier algologists to *F. vesiculosus* var. *inflatus*."

F. ceranoides L. (E.).—*F. spiralis* L. (*F. vesiculosus* var. *spiralis* E.).—*F. serratus* L. (E.).—*F. vesiculosus* L. (E.).

Ascophyllum nodosum (L.) Le Jol. (*Fucus nodosus* E.).

Pelvetia canaliculata (L.) Dene. et Thur. (*Fucus canaliculatus* L., E.).

Himanthalia lorea (L.) Lyngb. (E.).

Halidrys siliquosa (L.) Lyngb. (E.).

Acinetospora pusilla Born. *β crinita* Batters (*Ectocarpus crinitus* E.). Batters: *A Catalogue of the British Marine Algæ*, p. 53.

Rhodophyceæ.

Bangia fuscopurpurea (Dillw.) Lyngb. (*Bangia atropurpurea* E.).

Porphyra umbilicalis (L.) J. Ag. (*Porphyra vulgaris* E.).

Chantransia secundata (Lyngb.) Thur. On *Ceramium acanthonotum*. Muckle Holm.—*C. virgatula* (Harv.) Thur. Found on *Rhodymenia palmata*, *Gigartina mamillosa*, and *Porphyra umbilicalis*. Muckle Holm. Burra Voe.—*C. Daviesii* (Dillw.) Thur. On the stem of *Laminaria hyperborea*. Edmonston's *Callithamnion lanuginosum* is probably this species. Lerwick.

Helminthora divaricata J. Ag. (*Mesogloia Hudsoni* E.).

Choreocolax polysiphoniæ Reinsch.—Parasitic on *Polysiphonia fastigiata*. Burra Voe.

Gelidium cartilagineum Gaill. is recorded by Edmondston as washed ashore on the north side of the Island of Unst, but, as mentioned by Batters (*Catalogue*, p. 99) it is not a native of the British Isles.

Chondrus crispus (L.) Lyngb. (E.).

Gigartina mamillosa (G. et W.) J. Ag. (*Chondrus mamillosus* E.).

Callophyllis laciniata (Huds.) Kütz. (*Rhodymenia laciniata* E.).

Cystoclonium purpurascens (Huds.) Kütz. (*Gigartina purpurascens* E.).

Euthora cristata (L.) J. Ag.—Found in the lower part of the stem of *Laminaria hyperborea*. Mr. Batters writes to me that the late Mr. Traill also found this species near Lerwick.

Rhodymenia palmata (L.) Grev. (*Halymenia palmata* E.).

Lomentaria articulata (Huds.) Lyngb. (*Chylocladia articulata* E.). —*L. clavellosa* (Turn.).—Found growing on the stem of *Laminaria hyperborea* at a depth of about six fathoms. Lerwick.

Chylocladia kaliformis Hook. (E.).

Plocamium coccineum (Huds.) Lyngb. (E.).

Nitophyllum Bonnemaisoni Grev. (E.).—*N. laceratum* (Gm.) Grev. Some small specimens occurred epiphytic on the stem of *Laminaria hyperborea*. Lerwick.

Delesseria alata (Huds.) Lam.(E).—*D. sinuosa* (G. et W.)Lam.(E.). —*D. sanguinea* (L.) (Lam. (E.).

Odonthalia dentata (L.) Lyngb. (E).

Laurencia pinnatifida (Gmel.) Lam. (E.).

Polysiphonia urceolata (Lightf.) Grev. (E.).—*P. elongata* (Huds.) Harv. (E.).—*P. violacea* (Roth) Grev. (E.).—*P. fastigiata* (Roth.) Grev. (E.).—*P. nigrescens* (Huds.) Harv. (E.).—*P. atrorubescens* (Dillw.) Grev. (E.).—*P. Brodiæi* (Dillw.) Grev. (E.).

Spermothamnion Turneri (Mert.) Aresch. On the stem of *Laminaria hyperborea*. Lerwick.

Rhodochorton Rothii (Turt.) Näg. (*Calithamnion Rothii* E.).

Callithamnion arbuscula (Dillw.) Lyngb. (E.). — *C. granulatum* (Ducl.) Ag. (*Calithamnion spongiosum* E.). Edmondston records "*Calithamnion tetricum*" as "not unfrequent," but Mr. Batters tells me that it "is not at all likely to be found on the coast of Shetland; probably the species intended is *C. tetragonum β brachiatum*, which is abundant at Skaill in the Orkneys."

Griffithsia setacea (Ell.) Ag. (E.).

Ptilota plumosa (L.) Ag. (E.).

Antithamnion Plumula (Ell.) Thur. (*Callithamnion Plumula* E.).

Ceramium diaphanum Roth (E.).—*C. rubrum* (Huds.) Ag. (E.).—*C. acanthonotum* Carm. (E.).—*C. ciliatum* Ducluz. (E.).

Dumontia filiformis (Fl. Dan.) Grev. (E.).

Dilsea edulis Stackh. (*Iridæa edulis*, E.).

Furcellaria fastigiata (L.) Lam. (E.).

Hildenbrandia rosea Kütz. Lerwick, Burra Voe.

Dermatolithon macrocarpum Fosl. f. *Laminariæ* (Crn.) Fosl.—

Specimens quite like my specimens from the Færöes determined by Foslie were found on the stem of *Laminaria hyperborea*, at a depth of about six fathoms, at Lerwick.

Phymatolithon polymorphum (L.) Fosl. Muckle Holm.
Corallina officinalis L.—Muckle Holm. Lerwick.

THE BOTANY OF SIAM.

By Frederic N. Williams, F.L.S.

Little seems to be known of the vegetation of Siam. As compared with less favoured, as well as less accessible, countries, it has been strangely neglected by the botanical explorer and plant collector. European herbaria, which are so frequently enriched with parcels of plants from distant lands sent home by diplomatic agents, military men, and missionaries, who find relaxation in scientific pursuits, are but little indebted to these often assiduous workers in the field of geographical botany, in the case of Siam.

Only two important contributions to the botany of Siam have appeared:—(1) *On the Flora of the Eastern Coast of the Malay Peninsula*, by Mr. H. N. Ridley, in Transact. Linn. Soc. ser. 2, vol. iii. (1893), dealing chiefly with the British Protected Malay state of Pahang, but including several plants from the adjoining Siamese dependencies of Kelantan and Tringganu in Lower Siam, extending from the borders of the state of Perak to the east coast of the peninsula; and (2) *The Flora of Koh Chang*, investigated by the Danish Scientific Expedition of 1899–1900, and now being written up in the pages of the Botanisk Tidsskrift of Kopenhagen, from May, 1901, to November, 1902, by Mr. J. Schmidt, with several co-workers. This is an island in the Gulf of Siam, of some seventy square miles, and is but a small area of the Siamese kingdom, which, with the encroachments of a Western Power, under the euphemistic pretext of extension of "sphere of influence," has in the last two decades undergone a certain amount of shrinkage, especially on its eastern borders. With the relaxation of control among the Shan tribes, much of their territory can no longer be considered an integral part of Siam, and the northern limit of the kingdom is lowered further in the direction of the equator. The area dealt with in the list of plants under preparation is coincident with the present political boundaries of Siam. These limits may be defined as follows:—On the north, lat. 20° 32′ N.; on the south, lat. 4° 32′, to the Malay Protected States under British suzerainty; on the west, the British-Indian province of Burma, towards which the furthest point reaches long. 97° 43′ E.; and on the east, the R. Mekong, separating Siam from the Lao Province of French Indo-China, along its southward course to the northern limits of Cambodia, on which side the country extends to long. 106° E.

The material for enumerating the plants of Siam available in

the Kew Herbarium is from a very few collectors. After overhauling many of the contents of the Malayan bundles within the genus-covers in various parts of the Herbarium, and consulting miscellaneous manuscript lists of collectors kept in the library, the only sets which afford specimens of plants collected in Siam are given in detail below.

Curtis, Charles.—His Malayan collections (1881–1899) include several plants from the Langkawi Islands, off the west coast of Lower Siam, and from the Kedah district on the mainland opposite, beyond the northern frontier of British Malaya.

Murton, H. J.—A set of plants received at Kew in 1878–82.

Pierre, Dr. L.—Various sets of plants received at Kew, 1880–1899. The set dated 1882 includes only twenty-seven sheets of Dicotyledons, and there are no Monocotyledons. All the other specimens in this set were collected in Cochin-China and Cambodia.

Schomburgk, Sir Robert Hermann, British Consul at Bangkok.—Of this set of three hundred and forty-five numbered sheets, collected at Aden, Singapore, in Penang, and Siam, two hundred and thirty-nine sheets (nos. 104–342) are of specimens collected in Siam, many near Bangkok, and some in the province of Angkor (mostly dated 1859). Several of these, however, though appearing by name in the manuscript list, are not to be found in the Herbarium. They were probably poor specimens or too much damaged to be laid in and incorporated in the general collections. The list therefore is a complete record of specimens received, of which some were put aside. This able diplomatist is not to be confused with Sir Richard Schomburgk, who collected in N. Australia and Polynesia.

Teysmann, J. E.—A set of Malayan plants, mostly from the Dutch possessions, but including some collected in Siam, received at Kew in 1878.

Wray, Leonard, Junr.—His Malayan collections (1884–1895) include some plants from the Kedah and Patani districts, north of the Siamese territory visited by Mr. H. N. Ridley.

Zimmermann, Dr. Albrecht.—A set recently purchased for the Kew Herbarium, and at present being sorted and laid in. The collection includes many plants collected in Siam, in the area extending round Bangkok.

There is also a small collection from "Upper Siam" made by the late Mr. F. H. Smiles in 1893, and received at Kew in the following year. Localities are not given in many instances; but in going through the specimens, and testing in a recent map those which are given, I find that they are all on the east side of the R. Mekong, in the Lao province of French Indo-China. The plants were all collected in the same area, and are therefore presumably outside the present political boundaries of Siam, and therefore the parcel of specimens is not available for inclusion in the list of the plants of the country. Some of Mr. Ridley's plants from Lower Siam are at Kew. The other sources of information available for reference include the accounts of embassies to Bangkok, periodical consular reports on economic products, Foreign Office papers, and

scattered references in books of travel. An examination of the indexes in Just's *Jahresbericht* for many years has not resulted in the finding of a single paper or memoir dealing with the plants of Siam. I have ransacked one after another a score of shelves of Malayan plants in the Kew Herbarium, and found but a single specimen of a plant labelled with a locality "in Siam," and on referring to an authentic map the place mentioned turns out to be in Cambodia or Cochin-China. The records are complicated by collectors' inacquaintance with the language, and their use of the Siamese terms for river, lake, mountain, and valley, as though they were proper names, or even as local names of the plants (usually trees) themselves. Such a tautological expression is "the island of Koh Chang," as "Koh" itself means island.

Among the commercial products alleged to come from Siam is the balsamic resin, obtained by incisions in the bark of *Styrax benzoin*, known as Siam benzoin. As long ago as 1865, Sir R. H. Schomburgk was asked to obtain specimens of the tree yielding the gum, but was unable to do so. Some time afterwards Capt. Hicks received a few young specimens labelled as coming from "Suang-Robang." This was ascertained to be intended for Luang-Probang, a town in the French province of Anam. The tree yielding the resin is not known to exist now in Siam, but the source of the gum is now found to be a circumscribed locality on the east side of the River Mekong, in the Lao province of French Indo-China (see Report by Mr. de Bunsen on the trade of Siam for 1893, Foreign Office Annual Series, 1895, n. 1520). This erroneous origin of the drug is given in all the European pharmacopœias. The odour of Siam benzoin recalls that of vanilla, while that of Sumatra benzoin is like official storax.

In the second volume of his *Kingdom and People of Siam* (1857), Sir John Bowring, under the heading of Natural Productions, gives a brief account of the principal economic plants which came under his notice. The fan-palm grows to an immense height in Siam; it produces fruit after fifteen years, and lives to an incredible age. The root of *Curcuma aromatica* is reduced to a fine yellow powder, and used for the ornamental colouring of the skin in women and children. Gamboge, the gum-resin exuded from *Garcinia Hanburyi*, is imported almost exclusively from Siam. The most common vegetables include maize, cucumbers, gourds, radishes, cabbages, mustard, lettuces, melons and water-melons, tomatoes, celery, mint, parsley, chervil, cummin, coriander, garlic, onions, leeks, beans, and peas. The sweet potato and the yam abound.

Two extensive local floras include also some Siam plants:—

Sir J. D. Hooker, *Flora of British India* (1872–1897).—By an "intelligent anticipation of events before they occur," a few parcels of plants are included which were sent from Peninsular Siam by English collectors who casually visited detached localities. This narrow strip cannot yet be considered an integral part of British India.

L. Pierre, *Flore Forestière de la Cochinchine* (1880–1899).—This sumptuous work, which contains 400 plates, on some of which two,

three, or four species are figured, often gives localities in Siam for species, some of which are figured and described from Siamese specimens.

Postscript.—By the Franco-Siamese Treaty of 7 October, 1902, which was only ratified a few days ago, and after this paper was in print, the eastern boundary of Siam is "rectified." The triangular dip of Siam, wedged in between Cambodia and the River Mekong, is now incorporated in the Lao province of French Indo-China. The line starts from the old frontier-post on the eastern shore of the Great Lake, or Toule Sap, and, mainly following the water-partings, makes almost straight for the cataracts of Khong, on the River Mekong: north of this, the river is still the eastern boundary of Siam. In this annexed area of Upper Siam several plants are indicated in Pierre's work, and these will not now be included in the list in preparation.

ALABASTRA DIVERSA.—Part XI.

By Spencer Moore, B.Sc., F.L.S.

(Continued from p. 139.)

Dr. Rand's Johannesburg Asclepiadaceæ.

Raphionacme divaricata Harv. Nos. 861, 1230.
R. Galpini Schlechter. Nos. 711, 1123.
Parapodium costatum E. Mey. No. 965.
Xysmalobium undulatum R. Br. No. 1120.

Xysmalobium Brownianum, sp. nov. Caule verisimiliter ascendente carnosulo folioso puberulo, foliis petiolatis oblongis acutis (superioribus oblongo-lanceolatis) marginibus præsertim foll. supp. in sicco crebre undulato-lobulatis basi obtusis truncato-rotundatisve crassiusculis costa centrali eminente puberula exempta glabris costis secundariis utrovis latere sæpissime 20–30, cymis interpetiolaribus sessilibus 7–12-floris, bracteis lineari-subulatis ciliatis quam pedicelli graciles pubescentes multo brevioribus, floribus parvis, calycis lobis lineari-lanceolatis acutis extus pilosis, corollæ lobis erectis dein patentibus oblongis obtusis marginibus leviter revolutis glabris infra apicem subcarnosulis alibi paullulum concavis, coronæ phyllis gynostegio æquilongis rhomboideis obtusis crassiusculis dorso maxime compressis intus omnino ecarinatis, polliniis compressis pyriformibus juxta insertionem insigniter angustatis quam caudiculæ prope glandulam inflatæ multo longioribus, stylo ab antherarum appendicibus breviter superato.

Hab. Open veldt to southward of Johannesburg. No. 1053.

Foliorum lamina 3·0–5·5 cm. long., foll. inf. 1·5–2·0 cm. lat., foll. sup. 0·4–0·8 cm.; petioli 0·8–1·5 cm. long., facie superiori puberuli. Bracteæ 0·4 cm., pedicelli ± 1·0 cm. long., hi patentes. Calycis lobi circa 0·35 cm., corollæ viridis lobi 0·55 cm. long. Coronæ phyllæ 0·3 cm. long. et lat., siccæ brunneæ, humectatæ purpureæ vel dilute griseo-puniceæ. Antherarum appendices in

sicco albæ, perspicuæ, 0·15 cm. lat. Pollinia 0·15 cm. et caudiculæ 0·04 cm. long. Stigma planum, circa 0·3 cm. diam.

From all species of similar appearance—*i. e.* with long crisply undulated leaves—distinguished by its small flowers and rhomboid keel-less coronal leaves.

I have named this in compliment to Mr. N. E. Brown, who very kindly allowed me the benefit of his great knowledge of *Asclepiadaceæ* while writing this paper.

Schizoglossum nitidum Schlechter. No. 706.
S. guelense N. E. Br. No. 1009.
S. pulchellum Schlechter. No. 962.

Schizoglossum Randii, sp. nov. Caule simplici stricto gracili fere a basi folioso deorsum tereti sursum ancipiti minute puberulo, foliis brevibus sessilibus anguste linearibus obtusis minute puberulis in sicco planis vel margine paullo revolutis, cymis interpetiolaribus sessilibus 3–4-floris, pedicellis perbrevibus validis puberulis, calycis lobis ovatis acutis extus fusco-puberulis, corollæ lobis erectis vel summum erecto-patentibus late oblongis obtusis extus minute fusco-puberulis, coronæ phyllis gynostegium superantibus rhombeo-ovatis apice attenuato breviter 2-dentatis margine basin versus utrinque semel brevissime lobulatis membranaceis intus deorsum bicarinulatis et sursum ligula lanceolata se ipsa bene excedente in stigma inflexa onustis, antherarum appendice late ovata inflexa, polliniis oblongis quam caudiculæ longioribus, stigmate parum depresso.

Hab. Open veldt to southward of Johannesburg. No. 1058.

Planta 40·0 cm. alt. Folia 1·0–1·5 cm. long., circa 0·1 cm. lat., in sicco erecta. Bracteæ subulatæ 0·2 cm. long. Pedicelli circa 0·1 cm. long. Calycis lobi 0·22 cm., corollæ lobi 0·4 cm. long., ambo verisimiliter sordide albi. Coronæ phylla 0·23 cm. long., juxta basin 1·7 cm. lat., horum dentes 0·03 cm. long., inter se sæpe inæquilati; ligula ad 0·06 cm. infra apicem squamæ inserta, 0·12 cm. long., apice sæpe minutissime denticulata. Gynostegium 0·2 cm. long. Antherarum appendix 0·1 cm. long. et lat. Pollinia 0·07 cm., caudiculæ 0·03 cm. long. Stigma 0·13 cm. diam.

Known by its strict unbranching habit with short narrow leaves, and straight rhomboid-ovate bifid corona leaves with inflexed lanceolate ligula.

Schizoglossum loreum, sp. nov. Caule simplici stricto gracili tereti longitrorsum pluristriato obscure puberulo cito glabro, foliis parvis sessilibus anguste linearibus apice mucronulatis, cymis interpetiolaribus sessilibus plurifloris, pedicellis quam flores longioribus patentibus demum recurvis una cum calycis corollæque lobis minute ferrugineo-puberulis, calycis lobis oblongo-ovatis acutis leviter carnosulis, corollæ lobis oblongo-ovatis obtusis intus appresse albido-pilosis, coronæ phyllis crassiusculis deorsum rhomboideis sursum in caudam elongatam attenuatam in stigma inflexam subito desinentibus intus bicarinatis eligulatis, antherarum appendice inflexa, polliniis oblongo-pyriformibus caudiculas juxta medium inflatas excedentibus, stigmate plano.

Hab. Open veldt to northward of Johannesburg. No. 1122.

Planta circa 45·0 cm. alt. Folia modica 2·0–2·5 cm. long., vix 0·1 cm. lat., marginibus saltem in sicco revolutis, pag. sup. glabra, pag. inf. præsertim in nervo centrali crasso ferrugineo-puberula. Cymæ inferiores 8–10-floræ, summæ circa 5-floræ. Bracteæ setaceæ, usque ad 0·25 cm. long. Pedicelli 0·6 cm. long. Calycis lobi 0·15 cm., corollæ lobi 0·25 cm. long., ambo purpurei. Coronæ phyllorum pars inferior lata 0·1 cm. long. et lat., pars attenuata adusque 0·2 cm. long. Gynostegium 0·13 cm. alt. Antherarum appendix 0·08 cm. long. Pollinia 0·06 cm. long., caudiculæ 0·25 cm.

This is much like *S. Randii* in habit and leaf. Its chief distinctive characters are the sessile cymes, the rusty clothing of the pedicels and flowers, and the rhomboid entire eligulate coronal leaves suddenly narrowed into a long tail-like continuation inflexed over the stigma.

Schizoglossum propinquum, sp. nov. Caule stricto gracili tereti distanter folioso sparsim pubescente, foliis brevibus sessilibus angustissime linearibus obtusis margine revolutis scabridis, cymis interpetiolaribus sessilibus 4–9-floris (sæpissime circa 5-floris), pedicellis flores subæquantibus erecto-patentibus pubescentibus, calycis lobis lanceolatis vel lanceolato-ovatis acutis extus pubescentibus, corollæ extus pilosæ vel glabræ lobis ovatis oblongis obtusis apicem versus crassiusculis albo-marginatis, coronæ phyllis gynostegium excedentibus late ovatis obtusissimus apice integris vel emarginatis vel etiam breviter 3-dentatis intus carinis duabus elevatis onustis eligulatis, antherarum appendicibus inflexis, polliniis oblongis caudiculas filiformes undulatas excedentibus, stigmate parum depresso, folliculis levibus sursum gradatim attenuatis ibique curvatis pubescentibus.

Hab. Open veldt generally, near Johannesburg. Nos. 860, 1125.

Caulis adusque 30·0 cm. alt. Folia modice 2·0–3·0 cm. long., 0·1 cm. lat., in sicco erecta. Bracteæ setaceæ, circa 0·3 cm. long. Pedicelli 0·3–0·5 cm. long. Lobi calycis 0·2 cm., corollæ 0·32 cm. long. Coronæ phylla 0·22 cm. long., 0·2 cm. lat., tenuia, alba. Antherarum appendices reniformes, 0·06 cm. lat. Pollinia 0·05 cm., caudiculæ 0·015 cm. long. Folliculi 7·0 cm. long.; pars lata 0·3 cm. long., ± 0·5 cm. lat.; pars angustata deorsum 0·3 cm. lat., sursum adusque 0·1 cm. imminuta.

Undoubtedly near *S. bilamellatum* Schlechter, which, with precisely similar habit and leaves, has smaller flowers and differently shaped corona leaves ending in an acute tip.

There are two forms of this, one with shorter pedicels than the other, broader calyx lobes and corollas pilose outside instead of glabrous. Dr. Rand notes the flowers as being "brownish." The leaves of the corona usually have three broad purple stripes, one running down the centre, and one at each side.

Asclepias densiflora N. E. Br. No. 968.
A. fruticosa L. Nos. 858, 859, 1127, 1128.
A. cultriformis Schlechter. No. 1126.
A. albens Schlechter. Nos. 864, 1011, 1119.

A. stellifera Schlechter. Nos. 704, 705, 857.
A. eminens Schlechter. No. 1008.
A. sulphurea Schlechter. Nos. 1046, 1124, 1232.
A. aurea Schlechter. Nos. 703, 1042.
A. Schinziana Schlechter. Nos. 862, 963, 964, 1229.

Asclepias Calceolus, sp. nov. Semispithamea caule fere a basi ramoso ramis ascendentibus abunde foliosis breviter pubescentibus, foliis brevissime petiolatis lanceolatis obtusis basi eximie rotundatis vel etiam paullulum cordatis marginibus angustissime revolutis utrobique (præsertim vero pag. sup.) scabriusculis, cymis interpetiolaribus umbellatis 5–7-floris, pedunculis ascendentibus sat validis folia subæquantibus una cum pedicellis patulis flores multo excedentibus minute pubescentibus, bracteis setaceis quam pedicelli multoties brevioribus, calycis lobis lanceolatis breviter acuminatis pubescentibus, corollæ parvæ lobis saltem patentibus verisimiliter tandem reflexis ovato-oblongis obtusis, coronæ phyllis abbreviatis sc. gynostegium exiguum paullulum solummodo excedentibus sensu radiali valde elongatis usque ad basin liberis calceoliformibus facie canaliculatis intus inappendiculatis lobis lateralibus horizontalibus lanceolatis obtusis gynostegio impendentibus, antherarum appendice rotundata inflexa, polliniis maxime compressis oblongo-pyriformibus quam caudiculæ multo longioribus, stigmate plano.

Hab. Open veldt to northward of Johannesburg. No. 966.

Folia 2·5–4·0 cm. long., prope basin sæpissime 0·7 cm. lat., in sicco erecta sc. cauli fere parallelia, siccitate brunneo-virescentia. Pedunculi 2·5–3·5 cm., pedicelli 1·5–2·5 cm., bracteæ circa 0·4 cm. long. Flores sicci 1·2 cm. humectati circa 1·6 cm. diam. Calycis lobi 0·4 cm., corollæ lobi 0·7 cm. long., hi in sicco brunneo-lutescentes. Coronæ phylla 0·15 cm. alt., sensu radiali usque ad 0·4 cm. elongata (lobis 0·12 cm. long. inclusis). Antherarum appendices 0·1 cm. lat. Pollinia 0·12 cm., caudiculæ 0·03 cm. long., hæ subito curvatæ. Stigma 0·23 cm. diam.

A beautiful little species, at once recognized by the curious short, and, when seen from above, slipper-shaped leaves of its corona.

Tenaris chlorantha Schlechter. No. 1121.
Sisyranthus Randii S. Moore. (*Vide ante*, p. 200, *in not.*)

Dichælia microphylla, sp. nov. Parvula, caule erecto ramoso ramisque griseo-velutino-pubescentibus, foliis brevibus sessilibus anguste oblongis obtusis utrinque pubescentibus, floribus mediocribus extra-axillaribus solitariis binisve, pedunculis 0, pedicellis abbreviatis pubescentibus, calycis lobis lanceolatis pubescentibus, corollæ tubo brevi sat lato lobis e basi ampla linearibus ad normam generis apice conjunctis extus piloso-pubescentibus intus glabris, coronæ phyllis exterioribus alte bipartitis segmentis erectis linearibus obtusis glabris quam phylla interiora oblonga obtusa supra gynostegium inflexa longioribus, antheris supra stigma inflexis, polliniis compressis ovoideis, stigmate leviter depresso.

Hab. Among rocks forming outcrops of the Witwatersrand series to northward of Johannesburg. No. 967.

Planta 0·8–0·9 cm. alt. Rami patuli, rarifoliati. Folia 0·4–0·7 cm. long., 0·2–0·3 cm. lat., in sicco sæpissime conduplicata, crassiuscula. Pedicelli 0·2 cm. long. Calycis lobi 0·2 cm. long. Corollæ tubus vix 0·2 cm. long., humectatus 0·4 cm. diam.; lobi deorsum circa 0·2 cm. lat., sursum 0·075 cm., hic purpurei, illic verisimiliter lutei. Coronæ phylla exteriora in toto 0·2 cm. long., lobi 0·15 cm. long. et 0·03 cm. lat.; phylla interiora 0·08 cm. long., 0·5 cm. lat. Pollinia 0·03 cm. long. Gynostegium 0·2 cm. long.

Probably nearest *D. Galpinii* Schlechter, from which it differs in its lowlier habit and pubescence, small sessile leaves, solitary or twin flowers, pilose-pubescent corollas with a wider tube, glabrous segments of the outer corona leaves, which are manifestly longer than the obtuse inner leaves, &c.

(To be continued.)

HYGROPHORUS CLARKII B. & Br., AND H. KARSTENII Sacc. & Cub.

By Worthington G. Smith, F.L.S.

In the *Annals and Magazine of Natural History* for May, 1873, p. 341, Messrs. Berkeley and Broome described a new, large and remarkable *Hygrophorus* under the name of *H. Clarkii* as follows:—"Fragilis: pileo convexo, subumbonato, livido-cinereo, viscoso; margine lævi; stipite concolori, cavo; lamellis latis, distantibus, crassis, adnatis, albis. Street, Oct., 1872, J. A. Clark, no. 1788. Gills in large specimens nearly ½ inch wide."

The description is imperfect, but as far as it goes correct.

The examples from which the description was made were sent to me by Mr. Clarke, and I forwarded them to Mr. Berkeley with a water-colour drawing of three examples, a section and a drawing, with measurement, of the spores. This drawing has long been in the National Collection of Botany at the British Museum.

In 1874 Fries copied the description without alteration in his *Hymenomycetes Europæi*, p. 415.

In 1886 Stevenson in his *British Fungi* (ii. 82) reproduced the description in English, but added "In pastures."

In 1887 Saccardo in his *Sylloge* (v. 406) copied the Berk. & Br. description with the addition "In sylvis Angliæ."

In 1889 Dr. Cooke in the new edition of his *Handbook* added "In woods," and gave the measurement of the spores as $12 \times 10\,\mu$. Accompanying Dr. Cooke's description is a plate,—*Illustrations*, pl. 934, A, of what purported to be *H. Clarkii* B. & Br., but the plate has no resemblance whatever to *H. Clarkii*, and the spores illustrated are not right either in size or shape.

In 1893 Mr. Massee, in his *British Fungus Flora* (ii. 349), extended the description of *H. Clarkii* very much, apparently from Cooke's figure, and as this figure has no resemblance to the original plant, of course all Massee's additions are wrong.

The mistakes are best seen by contrasted characters as follows:—

Erroneous Description.	*Correct Description.*
Pileus, 1–1¾ in. across, flesh rather thin, — white with a silky gloss, here and there stained with brown.	Pileus 3¾–4¼ in. across, flesh very thick, wholly umber, with a white margin.
Stem — 2 lines thick, smooth, grey, base white.	Stem 1¼ in. thick, white and viscid-squamose above, faintly brown below.
Gills broadly adnate, with a decurrent tooth.	Gills adnate, slightly rounded, with no decurrent tooth.
Spores 12 × 10 μ.	Spores 10 × 6 μ.

In Massee's *European Fungus Flora*, 1902, p. 76, the errors are repeated. In the *Transactions of the British Mycological Society* for 1902, p. 14 (1903), Dr. Cooke describes as a new British *Hygrophorus*, *H. latitabundus* Britz. The description, apparently drawn up from nature, or from Britzelmayr's very bad illustration (Britzelmayr gives no description) or from Saccardo's "faked up" description, is really a fair description of *H. Clarkii* B. & Br. Dr. Cooke also adds, "Street, Somerset," the habitat of *H. Clarkii*. He also says that *H. latitabundus* has been confounded with *H. limacinus*, and that "the spores are smaller, — 10 × 6–7 μ," the exact size of the spores of *H. Clarkii*.

On referring to Saccardo's description (v. 395) of *H. latitabundus* Britz., he says this plant is the same with a plate given by Kalchbrenner, 1873, and named *H. limacinus*, Fr. It is doubtful whether Saccardo is correct, but whatever Kalchbrenner's t. xxiv. fig. 1, or Britzelmayr's fig. 14, or Cooke's 934, may represent, the name of *Hygrophorus Clarkii* B. & Br. must stand as the earliest name of a most distinct species, it being understood that Massee's compounded description represents nothing. If Britzelmayr's plant is anything it is *H. Clarkii* B. & Br.

In the *Naturalist* for Nov., 1902, p. 356, *Hygrophorus bicolor* Karst. is published as a new British species. Karsten apparently did not know of the existence of *H. bicolor* B. & Br.; Saccardo, however, knew, and altered Karsten's name to *H. Karstenii* Sacc. & Cub. In Massee's *European Fungus Flora*, p. 75, *H. bicolor* Karst., and *H. Karstenii* Sacc. & Cub. are given as two distinct plants with two curiously different translations. This slip should be altered in a future edition.

SHORT NOTES.

Festuca maritima L. in Britain.—This species (the *F. hispanica* Kunth, and *Nardurus tenellus* Godr. of Nyman's *Conspectus*) has been gathered in Lincolnshire by the Rev. Adrian Woodruffe-Peacock. Specimens were sent to Prof. Hachel, who so named them, and the name is accepted by Dr. Rendle. Full particulars will be published as soon as its distribution, &c., are worked out.—Arthur Bennett.

Primula elatior L.—Dr. Gilbert's suggestion (p. 281) that this species may have originated from a cross between the cowslip and

the primrose is not, I think, favoured either by its characters (which are but superficially intermediate) or by its British distribution. Here it practically replaces *P. acaulis* over considerable areas, *P. veris* being present in abundance, and it is a very different plant from all forms of the polymorphic hybrid *P. acaulis* × *veris*, nor does it show any special preference for wet ground. The case of the Tunbridge Wells Common brambles is not parallel; most of them were probably *bird-sown* at first, and are of frequent occurrence in the neighbouring parts of Kent and Sussex. Few English botanists have more persistently maintained the existence of hybrids than myself; they are not rare in *Rubus*, but hybridity alone cannot account for the great variety which we possess. Dr. Krause, in Germany, has pushed this theory to a *reductio ad absurdum*; and I wish to protest, at once, against the adoption of such extravagant notions by our countrymen.—EDWARD S. MARSHALL.

NOTICES OF BOOKS.

Flora of the Island of Jersey. By L. V. LESTER-GARLAND, M.A., F.L.S. Small 8vo. Pp. 205 + xv, with Map. Price 6s. West, Newman & Co., 54, Hatton Garden, London.

FROM several standpoints the latest addition to the list of British local floras is welcome. For the first time in the history of British Botany, we are offered a local flora in which the systematic arrangement of the advanced German school of Engler and Prantl is followed. This is, indeed, a new departure, as the author states, "which will possibly provoke adverse criticism." It is doubtful whether it will. A systematic classification of plants, based upon the Theory of Descent, has so long been a *desideratum* among scientific botanists, that such a course will excite little opposition, except from conservative plant-sorters of the old school; and not much regret will be expressed at the disappearance of the pre-evolutionary system associated with the names of Jussieu and De Candolle, which was but little less artificial, and far less convenient, than the so-called sexual system of Linnæus.

In the introduction to his Flora, Mr. Lester (to speak of him by his former name, by which he is better known) has so ably stated and so clearly established the case for reform, that it is only necessary to refer the reader to the fifth section, in order to judge for himself as to whether the time has not arrived for British botanists to come into line with the systematic workers of Germany, Denmark, and Italy. The author, long resident in Jersey, and familiar with every spot on the island, has a first-hand knowledge of its plants, and is fully competent to dispense with casual "authorities" whose acquaintance with Jersey plants has been more often haphazard in character. The bibliography available only serves to show its exiguous value. Not the least useful chapter in the volume is the handy classified list of the genera of British plants, picked out from Engler and Prantl's great work, arranged

in series and families, and so accessible for reference by those who may adopt the sequence in future local floras. Many names, of course, are unfamiliar to those who scan English plant-lists—*e. g.* *Sparganiaceæ* for the natural family which includes only *Sparganium*; *Cypripedilum* for the meaningless *Cypripedium*; the splitting off of *Odontites* and *Parentucellia* from *Bartschia*; *Satureia* L. instead of *Calamintha* Lamk.; *Chrysanthemum* as including *Tanacetum*; *Pirus* instead of the philologically corrupt *Pyrus*; *Torilis Anthriscus* for *Caucalis Anthriscus*; *Adoxaceæ* as a family separate from *Caprifoliaceæ*; &c. One new name only is in the list—*Crassula Tillæa* Lester (p. 87). As the author says—"Since Engler and Prantl merged the Linnean genus *Tillæa* into *Crassula* in 1890, no new list of *Crassula* has been published. The specific name *muscosa* is not available, as there is already an African *Crassula muscosa* L. I am therefore obliged reluctantly to suggest a new specific name." The author's modest reluctance is quite unnecessary, as the name is most suitable and appropriate.

Among the details of the Flora itself, it is interesting to note that Mr. Lester accepts *Dianthus gallicus* as a genuine addition to the British Flora—"the locality seems beyond suspicion." It certainly is found under similar conditions on the west coast of France. The other plants which happen to be peculiar to Jersey are not specially mentioned; but from the detailed list I can only discover four which are not found either in Britain proper, or in any of the other Channel Islands. These are—*Scirpus pungens*, *Ranunculus chærophyllus*, *Echium plantagineum*, and *Linaria Pelesseriana*, all considered native. *Ranunculus ophioglossifolius* is unfortunately now quite extinct in the Channel Islands (though Mr. Arthur Bennett has a specimen from St. Peter's Marsh, dated 1872). It is now known to occur only on marshes in South Hampshire.

Mr. Lester has preferred *Parentucellia* to the earlier *Trixago*, and rightly so, as the latter genus is badly defined, and its characters would include species already well placed in other genera. Interesting notes on such plants as *Nasturtium officinale*, *Orobanche cærulea*, *Trifolium Molinerii*, and *Centaurea aspera*, are valuable to the critical student. The Berlin reformers ignore such revivals as *Roripa*, *Castalia*, *Neckeria*, *Homalocenchrus*, and similar neglected generic names. Few slips are noticeable. *Cirsium anglicum*, attributed to Lobel (1581), is correct, but pre-Linnean; for this name De Candolle should be cited as the authority. I have elsewhere suggested that *Cirsium britannicum* Scop. should be the name of the English plant otherwise known as *Cnicus pratensis* Willd.; though Mr. W. P. Hiern has given good reasons for questioning the correctness of the application of the name. When quoted, Prof. E[duard] Hackel has the "a" in his name modified, and is thus likely to be confused with Prof. E[rnst] Häckel, of Jena. The redoubtable champion of advanced scientific opinions would probably grieve at being mistaken for one who has mainly concentrated his energies on the study of grasses. "*Rhaphanus*" and "*Chichorium*" are not accepted spellings; the latter, but not the former, is correct in the index.

The general 'form' in which the Flora is presented leaves nothing to be desired. The book is well printed on good paper, neatly bound, handy and portable for the use of the field-worker, and has an excellent map. A botanist visiting any part of the Channel Islands would be sufficiently equipped with it, as, at the end of the book, there is a tabulated and comparative list, carefully compiled, of the plants found in all the islands of the archipelago. From a business point of view, it ought to sell well, and should be in the hands of all critical students of the British Flora.

FREDERIC N. WILLIAMS.

THE ORIGIN OF RUSTS.

PROFESSOR JAKOB ERIKSSON, the distinguished Swedish mycologist, has recently published, in the *Arkiv für Botanik K. Svensk. Vet.*, a reply to Prof. Marshall Ward's criticism of his work on the origin of Rusts. Eriksson holds that the appearance of Rust on cereals and other plants cannot, in many cases, be accounted for by external infection. Not only in the field, but in carefully protected cultures, pustules of rust have grown on the host plant where, seemingly, external infection was impossible. He has therefore come to the conclusion that the disease must be inherent in the host plant; and to account for the many otherwise inexplicable outbreaks of the disease he has put forward his hypothesis of a mycoplasma that lives in symbiotic relationship with the protoplasm of the higher plants. In many seasons it has an injurious effect on the host; it is only in specially favourable conditions of temperature or humidity that it becomes an active and injurious parasite, forming the well-known *Uredineæ* fruits. Eriksson terms this spontaneous appearance of the rust a case of primary infection, to distinguish it from the secondary infection, which is directly due to spores. Mycoplasm as yet remains a hypothesis—its author has failed to prove it either in the seeds or in the growing plants; he hopes, however, that as methods improve it may become demonstrable. He sectioned by hand the tissues in the immediate neighbourhood of "primary" pustules, and he found in the cells bodies, resembling the protoplasm of the host, either floating from or attached to the wall of the cell; these bodies, which he calls *corpuscles spéciaux*, grow out, pierce the cell-wall, and become the fungus hyphæ of the *Puccinia*, and he considers them, in the early stage, to be the first visible appearance of the mycoplasma, and the intermediate form between the mycoplasma and the mycelium.

Marshall Ward has also attacked the problem of Rust-infection, and he has grown plants susceptible to the disease for the first time in completely sterilized conditions from the seed to the mature plant. On these plants he has had no instance of fungus growth. He has also examined the diseased tissues by serial sections, and has come to the conclusion that Eriksson's *corpuscles spéciaux* are merely the ends of haustoria of quite normal hyphæ, which had been separated from the parent hypha by the mechanical process of cutting the section. They are therefore the product, and not the origin of infection. Eriksson, in his reply, states that Marshall Ward has

misunderstood the point at issue—that he has examined cases of diseased tissue due to external or secondary infection, while the *corpuscles spéciaux* are only present in connection with primary pustules. It might be easily possible to settle the question of these *corpuscles* if Eriksson were to make serial sections through similar tissue to that in which he has already found them, and so determine their absolute isolation. Marshall Ward might also apply his exact methods to pustules warranted by Eriksson as due to primary infection. It might also be possible for Marshall Ward to obtain from the Swedish laboratory some of the seeds of cereals that so constantly become rusted in the protected cultures, and to grow them in the sterile conditions perfected by him. Onlookers may have and hold their opinions on the mycoplasma hypothesis, but the question cannot be considered as settled until further work is done.

A. L. S.

BOOK-NOTES, NEWS, &c.

The first instalment of the Catalogue of the Library of the British Museum (Natural History) has been issued by the Trustees. It is a handsome quarto volume of five hundred pages, and includes the letters A–D, containing about 15,000 entries. It has been compiled by Mr. B. B. Woodward, the assistant in charge of the General Library, and edited by him with the assistance of representatives from the several departments—from that of Botany, Mr. Britten.

The Rev. Henry Edward Fowler Garnsey, Senior Fellow of Magdalen College, Oxford, who died at Bath at the end of June, and was buried in the Abbey Cemetery on July 3, was born in 1826 at Coleford, Gloucestershire. He was educated at Worcester and Magdalen Colleges, and took his degree in 1846; in 1854 he was ordained, and proceeded B.D. in 1858. Mr. Garnsey was interested in botany, especially in bryology; but his name is chiefly familiar in connection with the translations of Goebel's *Outlines*, Count Solms's *Fossil Botany*, Sachs's *History of Botany*, and other German works. His help in revising the MS. and examining the proofs of Mr. Druce's *Flora of Berkshire* is acknowledged in the preface to that work.

Mr. Carruthers, at the special request of the Committee of New College, Edinburgh, has undertaken to fill next winter the Chair of Natural Science at that college.

The seventh annual week's fungus foray of the British Mycological Society will be held at Marlborough, for an exploration of Savernake Forest, from Monday to Saturday, 5th–10th October. On Wednesday evening, 7th October, Miss A. Lorrain Smith will read a note on *Gloeosporium Tiliæ*, a disease of lime leaves, and Mr. Carleton Rea, the Hon. Sec. of the Society, will read a note on the occurrence of a Phalloid new to Britain. On the following evening the Rev. W. L. W. Eyre will deliver his Presidental Address, entitled 'Mycology as an Instrument of Recreation.'

The Rôle of Diffusion and Osmotic Pressure in Plants, by Burton Edward Livingston, forms one of the latest of the decennial publi-

cations of the University of Chicago. The volume is divided into two parts: the first deals with the purely physical aspect of these phenomena; the second, which is of more direct interest for the botanist, presents the physiological results which have so far been achieved in these connections. Part ii. comprises four chapters. The first three—entitled respectively Turgidity, Absorption and Transmission of Water, and Absorption and Transmission of Solutes—deal with osmotic pressure as an internal factor in the life of the plant; in them are considered the most important effects of the development of diffusion-tensions within the plant-body. In the last chapter, "Influence of the Osmotic Pressure of the Surrounding Medium upon Organisms," are brought together the responses of the organism to variations in the osmotic pressure of the surrounding medium. As far as investigation has gone, it has been found that growth is accelerated in weak solutions and retarded in concentrated ones. In some cases at least, the direction of new walls is profoundly influenced by the concentration of the surrounding medium. In general, all vital processes are retarded in concentrated solutions. Irritability is also greatly influenced by external pressure. All the effects of high concentration of the surrounding liquid seem to be due to extraction of water from the living cells.

The success of his previous little book, *Mosses with a Hand-lens*, by which seventy-five to one hundred common mosses of the north-eastern United States can be easily identified with the help of a simple lens of ten to fifteen diameters, has induced the author, Dr. A. J. Grout, to prepare a more detailed work—*Mosses with Hand-lens and Microscope* (New York, 1903. Part i., 86 pp.; 10 plates and 81 figures in the text; price one dollar)—which will suffice for the determination of twice as many species. Part ii. will probably appear next January, and two or three more instalments will complete the work. The introductory chapters treat of classification and nomenclature, collection and preservation of specimens, mounting, methods of manipulation for microscope work, life-history, and structure of mosses. Then follow a good illustrated glossary and a key to the tribes. Coming to the systematic part, we find the plants treated tribe by tribe in simple language. Keys to the families, genera, and species are inserted where necessary, and interesting field-notes are added. The text is richly illustrated with figures drawn from Bruch and Schimper's *Bryologia Europæa*, Sullivant's *Icones Muscorum*, &c. And the whole work is very attractive, and is well adapted to the needs of the elementary student, but cannot fail to be of great help to bryologists who have an advanced knowledge of the subject.—A. G.

The additions that have been made to the European moss-flora since the publication of the second edition of Schimper's *Synopsis* in 1876, as well as the near completion of Limpricht's *Laubmoose* of middle Europe, make us feel the want of a new synopsis which is up to date. Possibly *Die Europäischen Laubmoose* by Georg Roth will serve the purpose. The first part of this work (Leipzig: Engelmann. 1903. Pp. 128; 10 plates; price four marks) has recently appeared. The whole work will cost nearly £3, and will consist of

ten to twelve parts, forming two volumes. The author devotes ninety-two pages to a general introduction, treating of the main anatomical features of the mosses, their modes of reproduction, their distribution in zones of altitude, and on geological strata, and the part they play in the economy of nature. He discusses the collection and determination of specimens, and the principal schemes of classification. The scheme adopted by the author approximates to Limpricht's, but differs in the positions accorded to the *Seligeriaceæ* and *Fissidentaceæ*, and in the subdivisions of the *Hypnaceæ*. A valuable and extensive bibliography is provided. In the systematic part of the work descriptions are given of the tribes, families, genera, species, &c., with notes on the distribution of the species. Each species is figured; but the plates, great as their scientific value may be, can hardly be regarded as an artistic success. The figures are crowded, and in their details have suffered from the photographic process by which they have been reproduced from the original drawings. However, it will be an immense boon to have figures of all the European species.—A. G.

In a booklet entitled *What does Science say?* (Catholic Truth Society, 69, Southwark Bridge Road, S.E., price 2d.) the Rev. John Gerard, S.J., deals with the utterances of the Director of Kew Gardens apropos of Lord Kelvin's remarks on the relation of science to religion. We have already (p. 224) quoted the verdict of the *Times* on Sir W. Thiselton-Dyer's method of controversy; and Father Gerard has an easy task in showing that the claims the Director makes on behalf of the Darwinian theory are by no means deducible from the statements of its more modest author. "What that theory did," says the Kew Director, "was to complete a mechanical theory of the universe by including in it the organic world." On this Father Gerard remarks:—"Mr. Darwin never said a single word, or adduced a single fact, that could lend any colour whatever to the claim thus advanced on his behalf, of having furnished a complete mechanical theory of the universe, by including it in the organic world. On the contrary, again and again throughout his scientific career, he disclaimed and repudiated any such notion, declaring that as to the origin of life he knew absolutely nothing; and although he ventured to surmise, on purely speculative grounds, that the organic world will one day be shown to have sprung from the inorganic, he emphatically denied that we have as yet any sort of proof to this effect—sometimes even that there is any prospect of such proof being discoverable." Father Gerard quotes from Darwin's letters between 1855 and 1882—the last written within two months of his death—passages distinctly disclaiming any such position as that claimed for him by his advocate. Darwin's last words on the subject were:—"Though no evidence worth anything has as yet, in my opinion, been advanced in favour of a living being, being developed from inorganic matter, yet I cannot avoid believing the possibility of this will be proved some day in accordance with the law of continuity." No one has suffered more than Darwin at the hands of his self-appointed exponents: hitherto these have been found among the Clodds and Grant Allens, and we are sorry that Sir W. Thiselton-Dyer should have joined their ranks.

LENTINUS LEPIDEUS Fr.

By Worthington G. Smith, F.L.S.

The accompanying illustration shows (natural size) a Clavaria-like fungus growth that was sent to the British Museum for identification by T. E. Lander, Esq., Blairhill, Rumbling Bridge, N.B., in August, 1903. It was found growing in rather damp black soil in a wood, attached to a root-fibre. There was a central fleshy club, with several smaller scale-like growths springing from the sides, something like the scales of a lily bulb, and from these scales, as well as from the chief club, grew numbers of thin

Lentinus lepideus Fr. (natural size).

Clavaria-like minor branches, as illustrated. The club itself is shown at A, and a longitudinal section at B; the three branches at C, D, and E, as well as the scale seen at F in section, with several minor pieces, were broken off in transit, but the scars could be seen from which the pieces had fallen, and the pieces could easily be replaced.

The surface was somewhat scurfy, and the colour pallid white below, and faintly brown above; all the secondary branches were pale brownish in colour. There were a few very faint sulphury stains both on the exterior and in the cut flesh. The substance was fleshy-fibrous, rather hard, and unlike Clavaria. The odour was somewhat strong, but not unpleasant.

It was determined to be *Clavaria gigantea* Schw. n. 1112, Syn. Amer. bor. p. 182 = *ACurtis gigantea* Fr. Summa Veg. Scand. p. 337,* and is the plant referred to by Berkeley in the *Gardeners' Chronicle* for March 16th, 1878, p. 339, as an abnormal condition of *Lentinus tigrinus* Fr.

The peculiar and somewhat strong odour, as well as the faint sulphury stains, pointed strongly to the next species, viz. *L. lepideus* Fr., as the normal form ; this species is more frequently abnormal in growth than is *L. tigrinus* Fr. ; it also has at first a strong and not unpleasant odour, which, however, sometimes develops into one of rotten cheese. The correctness of the guess was confirmed by Mr. Gepp, who examined and measured the spores, and found them to be identical in size and shape with those of *L. lepideus* Fr. No spores were really expected to occur, as the ultimate branchlets had no appearance of bearing fruiting surfaces. After the spores had been found, it was noted that the branchlets were really abnormally developed gill-growths with serrated apices in the style of the edges of the gills in *L. lepideus* Fr. It is quite probable that *L. tigrinus* Fr. may also sometimes produce this *Clavaria*- or *ACurtis*-like growth, but the spores of the two species of *Lentinus* are permanently different in size, and the two plants are doubtlessly distinct as species.

One of the spores of the Rumbling Bridge abnormal growth is shown at G ; its measurement is $13 \times 5\ \mu$; my measurements from true *L. lepideus* Fr. are $12 \times 5\ \mu$ and $11 \times 5\ \mu$. Mr. Carleton Rea's measurement is $10–11 \times 5\ \mu$, that of Saccardo $10–14 \times 6\ \mu$. In *L. tigrinus* Fr. the spores, according to my measurement, are only $7 \times 3\ \mu$; Saccardo says $6{\cdot}5 \times 3\ \mu$.

Botanists will remember many illustrations of abnormal forms of *L. lepideus* Fr. Sowerby figures an example in his t. 382. A normal plant is seen springing from a kind of fleshy sclerotium 3 in. long, and pale buff in colour ; from the base also springs three *Clavaria*-like growths. An unpublished drawing by Sowerby in the British Museum shows a normal plant springing from a vinous-brown sclerotium-like base, $\frac{3}{4}$ in. long. Mr. Carleton Rea has illustrated a plant apparently growing from a black sclerotioid base. Cooke, *Illustrations*, t. 1141 (1092), has also published a figure of a remarkable example. A specimen of *L. tigrinus* Fr., springing from a broad rhizomorphoid base, from which also grow nine *Clavaria*-like bodies—not unlike white *C. inæqualis* Müll.—is illustrated and described by Arcangeli, Nuovo Giorn. Bot. Ital. 1895, p. 57, t. 1. The small size of the spores in Arcangeli's plant—$7 \times 3\ \mu$, taken from a perfect fungus growing upon the mycelium which also produces the *ACurtis*—shows the correctness of the author's determination. Dickson's *Fasciculus Plantarum Cryptogamicarum*, t. 12, f. 9, probably belongs to the *Clavaria* form of *Lentinus*. This example grew on a door-frame in a wine-cellar at Hackney, according to a pencil note in the British Museum copy of Dickson's work.

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* "*ACurtis* Fr. . . . A *Curtis*, Botanico et Mycologo eximio Carolinæ, dictum genus, cum *Curtisia* non commutandum." Fries, *l. c.*

Dickson's engraving, however, is a mere curtailed illustration of one of three very fine coloured drawings by James Sowerby, preserved in the British Museum in a volume of original drawings made for J. Dickson's Plant. Crypt. Brit.

There is a very fine coloured illustration of an *ACurtis* form of *Lentinus*, under the name of *Ramaria ceratoides*, by Holmskiold, in *Fungi Danici*, t. 9, the figure at *b* being not dissimilar from a small example of the plant here illustrated; but in this plate, as in all other illustrations I have seen, no abortive gill-like growths bearing typical spores have been observed.

THE INDIGOFERAS OF TROPICAL AFRICA.

By Edmund G. Baker, F.L.S.

(Concluded from p. 267.)

⊙⊙⊙⊙ Leaflets 5–9, ovate or oblong. Legume torulose, 4–8-seeded. Calyx-teeth shallow, deltoid.

128. I. moniliformis.
I. torulosa Baker, *l. c.* p. 91 (1871), non E. Meyer(1835–37).
Hab. East Tropical Africa. Mozambique, *Kirk*!

⊙⊙⊙⊙⊙ Leaflets 5–7, oblong, subcoriaceous, pilose. Calyx-teeth deltoid.

129. I. Cameroni Baker in Journ. Linn. Soc. xv. p. 93 (1876).
Hab. British Central Africa. Tanganyika, *V. L. Cameron*!

⊙⊙⊙⊙⊙⊙ Leaflets 5–7, obovate or elliptical. Calyx-teeth linear-lanceolate.

130. I. subcorymbosa Baker in Fl. Trop. Afr. ii. p. 91 (1871); Hiern, Welw. Cat. i. p. 213.
Hab. Lower Guinea. Benguella, *Welwitsch*, no. 2053!

(*n*) Suffruticose at the base. Leaflets 4–7, alternate, elliptical or oblong-lanceolate. Racemes 6–10 cm. long.

131. I. Antunesiana Harms in Engler, Bot. Jahrb. xxvi. p. 285 (1899); Kunene-Sambesi Exp. p. 257 (1903).
Hab. Lower Guinea. Bengella, Huilla, *Antunes*, *Ramalho*. Between Kanjundu and Kuebe, *Baum*, no. 291!

(*o*) Shrubs with rather large leaflets (3–11), allies of *I. rhyncho-carpa* Welw. Calyx short.

⊙ Leaflets 7 rarely 9, 4–7 cm. long, 2–3·3 cm. broad, oblong or subobovate. Racemes shorter than leaves. Legume coriaceous, terete, upturned at the end, where it is curiously tumid and rugose, ∞-seeded.

132. I. rhynchocarpa Welw. ex Baker, *l. c.* p. 92 (1871); Hiern, *l. c.* p. 213.
Hab. Lower Guinea. Pungo Andongo, *Welwitsch*, no. 2015! Huilla, *Welwitsch*, no. 2017!

⊙⊙ Leaflets 3–7, 3–4·5 cm. long, 10–18 mm. broad. Raceme 8–14 cm. long.

133. I. NAMBALENSIS Harms in Kunene-Sambesi Exp. p. 258 (1903).

Hab. LOWER GUINEA. Nambali, *Baum*, no. 254.

⊙⊙⊙ Leaflets 7–11, elliptical or oval, 1·8–3·0 cm. long, 1·1–1·5 cm. broad. Legume, ± 15-seeded, apex incurved.

134. I. GARCKEANA Vatke in Oest. Bot. Zeit. xxix. p. 221 (1879); Schweinf. in Bull. Herb. Boiss. 1876, App. ii. p. 243.

Hab. NILE LAND. Eritrea, *Schweinfurth*, no. 424. Niamniam Land, *Schweinfurth*, nos. 3785! and 3748! Dar Fertit, *Schweinfurth*, Ser. ii. no. 45 (1871). GALLA TERRITORY. Between Tumpi and Ciaffra, *Riva*. EAST TROPICAL AFRICA. Kitui in Ukamba, *Hildebrandt*, no. 2795! Kilimanjaro, *Volkens*, no. 1567! Usambara, fide *Engler*.

Dr. Harms (Kunene Exp. p. 258) considers this species may have to be united with *I. rhynchocarpa* Welw.

⊙⊙⊙⊙ Leaflets 3–7, 1·2–1·5 cm. long, oval, emarginate, mucronulate. Raceme 2–3 times longer than the leaf. Legume glabrous, 8–9-seeded.

135. I. BINDERI Kotschy in Sitz. Acad. Wien. Math. Nat. li. Abth. ii. p. 364, t. 6B (1865); Baker, *l. c.* p. 91.

Hab. NILE LAND. Banks of the White Nile, *Binder*. Bongoland, *Schweinfurth*, no. 2525! Djurland, Seriba Ghattas, *Schweinfurth*, no. 1534!

⊙⊙⊙⊙⊙ Leaflets generally 7, 5–6·3 cm. long, oblong-mucronate or oblong-ovate. Legume ∞-seeded.

136. I. LONCHOCARPIFOLIA Baker in Kew Bull. 1897, p. 256.

Hab. BRITISH CENTRAL AFRICA. Fort Hill, Nyassa, Tanganyika plateau, alt. 3500–4000 ft., *Whyte*!

(*p*) Shrub. Leaflets ± 7, ovate or oblong-ovate, 2–8 cm. long, 1·8–4·2 cm. broad, cuspidate. Calyx shortly dentate. Legume subcompressed, apiculate.

137. I. TETRAPTERA Taub. in Engler, Bot. Jahrb. xxiii. p. 181 (1896).

Hab. LOWER GUINEA. Luatschim, *Marques*, no. 328. Mukenge, *Pogge*, no. 795.

(*q*) Multicaulescent perennial, thinly strigose. Leaflets 5–7, oblanceolate or narrowly obovate, mucronate. Legume 4–5, sometimes 1–2-seeded.

138. I. HETEROCARPA Welw. ex Baker, *l. c.* p. 90 (1871); Hiern, *l. c.* p. 212.

Hab. LOWER GUINEA. Angola, Huilla, *Welwitsch*, no. 2051!

(*r*) Suffruticose. Leaflets 5–7, oblanceolate, lateral opposite. Calyx-teeth setaceous.

139. I. SETIFLORA Baker, *l. c.* p. 90 (1871); Hiern, *l. c.* p. 213.

Hab. LOWER GUINEA. Huilla, *Welwitsch*, no. 2020!

(*s*) Perennial. Leaflets 3–7, ovate or oblong, lateral opposite. Racemes lax. Calyx-teeth setaceous.

140. I. MIMOSOIDES Baker, *l. c.* p. 90 (1871); Hiern, *l. c.* p. 213.

Hab. LOWER GUINEA. Huilla, *Welwitsch*, no. 2045 ! Ambriz, *Welwitsch*, no. 4151 !

(*t*) Perennial. Leaflets generally 5, oval-oblong. Legume subglabrous, 2- ? seeded.

141. I. UMBRATICOLA Vatke in Oesterr. Bot. Zeit. 1878, p. 202.

Hab. SOMALILAND. Meid, *Hildebrandt*, no. 1386 ! Wagga Mts., *Mrs. E. Lort Phillips* !

(*u*) Canescent suffrutex. Leaflets 5–9, small, obovate. Racemes few-flowered. Legume subcylindrical, 4–6-seeded.

142. I. ARGENTEA Burm. Fl. Ind. p. 171 (1768), non L.

I. Burmanni Boiss. Fl. Or. ii. p. 189 (1872).

I. semitrijuga Forsk. var. *β tetrasperma* DC. Prod. ii. p. 230 (1825).

I. arenaria A. Rich. *β strigosa* A. Terracc. in Ann. Bot. Ist. Rom. v. 109 (1893).

Hab. NILE LAND. Nubia, *Kotschy*, no. 361 ! Between Mourzuk and Kouka, *Oudney* ! Between Atbara and the Red Sea, *Schweinfurth*, no. 1796 ! Between Suakin and Berber, *Schweinfurth*, no. 661 !

(*v*) Argenteo-canescent shrubs. Leaflets 5–7, obovate or elliptical.

⊙ Leaflets very thick, lateral opposite. Legume 3·2–3·5 cm. long.

143. I. PRUINOSA Welw. ex Baker, *l. c.* p. 93 (1871); Hiern, *l. c.* p. 214.

Hab. LOWER GUINEA. Angola, Prov. Mossamedes, *Welwitsch*, no. 2035 !

⊙⊙ Lateral leaflets alternate. Legume 2·5–3·2 cm. long.

144. I. SCHIMPERI Jaub. & Spach, Illus. Pl. Or. t. 484 (1853–57); Baker, *l. c.* p. 93 ; Engler, Hochgebirgsflora, p. 258.

I. tettensis Klotzsch in Peters' Mossamb. Bot. p. 51 (1861).

Hab. NILE LAND. Abyssinia, *Schimper* (1852), no. 198. Nubia, *Schweinfurth*, no. 1793 ! EAST TROPICAL AFRICA. Zambesiland, *Peters*. Zanzibar, *Hildebrandt*, no. 942 ! SOUTH CENTRAL. Buluwayo, *Rand*, no. 39 !

Var. *oxyphylla* Franchet, Sert. Somal. p. 28 ; Engler, *l. c.*

Hab. SOMALILAND. *Revoil*. Wagga Mt. and Berbera Shore above high-water mark, *Mrs. E. Lort Phillips* !

(*w*) Canescent shrub. Leaflets 3–8, oblong, lateral alternate. Legume deflexed, mucronate, 3·0–3·5 cm. long.

145. I. BAUKEANA Vatke in Oesterr. Bot. Zeit. 1879, p. 220.

Hab. EAST TROPICAL AFRICA. Kitui in Ukamba, *Hildebrandt*, no. 2787 ! Kilimanjaro, *Volkens*, nos. 528 ! 1733 ! Samburi, *T. Kaessner*, no. 438 ! Usambara, fide *Engler*. SOMALILAND, GALLA TERRITORY, *Riva*.

Differs from *I. Schimperi* Jaub. & Spach in narrower leaflets, which are not so silvery-canescent.

(*x*) Suffruticose. Leaflets 9–17, oblong or elliptical. Racemes dense at apices, not secund. Legumes 2–3-seeded, with gland-tipped hairs.

146. **I. Kaessneri**, sp. nov. Species ad *I. velutinam* E. Meyer accedens, ramulis fusco-pilosis. Folia imparipinnata 4–8-juga cum impari utrinque strigoso-pilosa, foliolis brevissime petiolulatis obtusis mucronulatis discoloribus subtus pallidioribus. Stipulæ lineares quam petiolus multoties longiores. Racemi apices versus densiflori foliis subæquilongi vel paulo longiores, pedunculis rufo-pilosis, floribus breviter pedicellatis. Calycis lobi setacei fusco-pilosi quam tubus multoties longiores quam corolla breviores. Vexillum externe rufo-pilosum, carina obtusa. Legumen rectum dense patentim albo-pilosum et glandulosum apice oblique mucronatum sæpissime 2–3-spermum.

Hab. East Tropical Africa. Gaditu, *T. Kaessner*, no. 876; Herb. Mus. Brit. In flower and fruit, June 1, 1902.

An ally of the South African *I. velutina* E. Meyer, and in some respects of *I. atriceps* Hook. and *I. secundiflora* Poir.

Leaflets 8 mm.–1 cm. long, 2·5–5 mm. broad, somewhat cinereous. Calyx 3–4 mm. long. Legume 4–7 mm. long.

(*y*) Suffruticose or subherbaceous, erect. Leaflets 9–11, strigose pilose, oblong, lateral opposite. Racemes often about as long as the leaves. Legume not seen.

147. I. alboglandulosa Engler, Hochgebirgsflora, p. 258 (1892).

Hab. Nile Land. Abyssinia, near Dewari, *Schimper* (1863), no. 1547 !

(*z*) Undershrub. Leaflets 9–13, obovate-oblong or obovate, lateral opposite. Legumes densely clothed with black pubescence and gland-tipped hairs, 6–8-seeded.

148. I. atriceps Hook. f. in Journ. Linn. Soc. vii. p. 190 (1864); Baker, *l. c.* p. 94.

Hab. Upper Guinea. Cameroons, *Mann* ! *H. H. Johnston*, no. 68 !

(a^1) Herbaceous or suffruticose. Leaflets 9–13, oblong or obovate. Legume 2–4-seeded, clothed with grey or ferruginous often gland-bearing hairs.

149. I. secundiflora Poiret, Encycl. Suppl. iii. p. 148 (1813); DC. Prod. ii. p. 227; Baker, *l. c.* p. 94.

I. oligosperma DC. Prod. ii. p. 228.

I. glutinosa Schum. & Thonn. Pl. Guin. p. 370 (1827), non DC.

I. melanotricha Steud. in Schimp. Hb. Abyss. no. 761.

I. urostachya Fenzl in Kotsch. Pl. Æthiop. 509.

Hab. Widely spread in Nile Land, Upper Guinea, East Tropical Africa.

Var. nov. **Holstii.** Suffrutex copiose ramosus. Foliola sæpissime 9–11 parva acuta utrinque albo-strigosa. Pedunculi extremitates versus densiflori. Legumen maturum subturgidum sæpissime 2-spermum externe glandulosum.

Hab. East Tropical Africa. Usambara, *Holst*, no. 8987!

This was distributed as *I. secundiflora* Poir., but it differs from the typical form of that species in the smaller leaflets and in the inflorescence not being so markedly secund, but more congested towards the apices of the peduncles.

Leaflets 4–5 mm. long, 1·5–2·0 mm. broad. Ripe pod 4–5 mm. long.

(b^1) Annual or biennial. Leaflets 7–11, oblanceolate, lateral opposite. Legume torulose, 2–3-seeded.

150. I. microcarpa Desv. Journ. Bot. iii. p. 79 (1814).

I. Perrottetii DC. Prod. ii. p. 228.

I. enneaphylla Baker, *l. c.* p. 95, non L.

I. Richardiana Baillon in Bull. Soc. Linn. Par. (1883), p. 398.

Hab. Upper Guinea. Senegambia, *Perrottet*, no. 181! *Heudelot*. Lower Guinea. Loanda, *Welwitsch*, nos. 2011! and 2011*b*!

(c^1) Cinereo-canescent base frutescent. Leaflets 7–13, alternate or subopposite, oval or obovate. Legume tetragonal, ± 1·3 cm. long, ∞-seeded.

151. I. dodecaphylla Fic. & Hiern in Trans. Linn. Soc. Ser. 2, ii. p. 18 (1881).

Hab. East Tropical Africa. Upper course of the river Ninda. *Serpa Pinto*, no. 7.

(d^1) Argenteous perennial herb. Leaflets 7–13, obovate oblong. Legume 1·5–1·7 cm. long, 9–10-seeded.

152. I. daleoides Benth. ex Harv. Fl. Cap. ii. p. 200 (1861–62); Baker *l. c.* p. 95; Hiern, *l. c.* p. 214.

Hab. Lower Guinea. Angola, Benguella, *Welwitsch*, no. 2060!

Var. nov. **dammarensis.** Caulis ramosus griseo- vel cinereo-pubescens. Foliola alternantia 7–11 elliptica vel elliptico-obovata quam ea typi latiora utrinque griseo-strigosa. Racemi axillares apices versus confertiflori. Calycis lobi subulati quam flos breviores. Legumen haud visum.

Hab. Dammaraland. *T. G. Fen.* Herb. Mus. Brit.

Branches 10–14 cm. long. Leaflets 5–6 mm. long, generally about 4 mm. broad at the broadest point.

(e^1) Annual or biennial. Leaflets 7–9, oblanceolate oblong, lateral alternate. Legumen deflexed, subglabrous, 6–8-seeded.

153. I. endecaphylla Jacq. Collect. Bot. ii. p. 358 (1788); Ic. Pl. Rar. t. 570 (1786–93) (*hendecaphylla*); Baker, *l. c.* p. 96.

I. anceps Vahl ex Poir. Encyc. Supp. iii. p. 147 (1813).

I. Schimperiana Hochst. in Schimp. Hb. Abyss. no. 366.

I. pusilla Lam. Encyc. iii. p. 248 (1789).

I. onobrychiides Boivin ex H. Baillon in Bull. Soc. Linn. Par. i. p. 398 (1883).

Hab. Widely spread in Tropical Africa.

Var. *radicans* Welw. ex Baker, *l. c.*

Hab. Lower Guinea. Angola, Pungo Andongo, *Welwitsch*, no. 4150! Huilla, *Welwitsch*, no. 2039

Var. *angustifolia* A. Rich. Fl. Abyss. i. p. 182 (1847).
Hab. Nile Land. Abyssinia.

Var. *acutifolia* Chiov. in Ann. Ist. Bot. Roma, 1903, p. 88.
I. parvula Hochst. et Steud. Pl. Abyss. no. 1076, *fide* Chiov.
Hab. Nile Land. Amasen.

Var. *parvula* Chiov. *l. c.*
I. parvula Schweinf. Fl. Abyss. 1872, no. 1752.
Hab. Nile Land. Abyssinia.

(f^1) Undershrub. Leaflets 9–11, obovate or elliptical, lateral opposite. Legume not seen.

154. I. phyllanthoides Baker, *l. c.* p. 96 (1871); Hiern, *l. c.* p. 215.

Hab. Lower Guinea. Huilla, *Welwitsch*, no. 2044!

I have not followed Dr. Taubert (in Engler, Pl. Ost-Afrika, Theil c. p. 210) in considering this as synonymous with *I. dendroides* Jacq. It differs in the shape of the leaflets and in the calyx.

(g^1) Shrub. Leaflets 5–7, oboval, lateral opposite. Legume straight, coriaceous, ± 6-seeded.

155. I. Sedgewickiana Vatke & Hildebr. in Oesterr. Bot. Zeit. 1878, p. 202.

Hab. Somaliland. Serrut, near Meid, *Hildebrandt*, no. 1388!

Allied to preceding species.

(h^1) Copiously branched silvery shrub. Leaflets 9, obovate, lateral opposite. Legume sickle-shaped, slightly torulose, 3–4-seeded, or, in var. *brachycarpa* (Vatke), 2–3-seeded.

156. I. articulata Gouan, Illus. p. 49 (1772); Prain & Baker fil. in Journ. Bot. 1902, p. 141, cum syn.

I. argentea L. Mant. ii. p. 273, excl. syn. non Burm.

Hab. Nile Land. Nubia, *Kotschy*, *Schweinfurth*! Abyssinia, *Schimper*! Eritrea, *Schweinfurth*. Somaliland, *Robecchi-Bricchetti*.

Var. *brachycarpa* Vatke in Oesterr. Bot. Zeit. p. 213 (1878) (sub *I. argentea*).

Hab. Somaliland. Lasgori, *Hildebrandt*, no. 837.

(i^1) Suffruticose or subherbaceous. Leaflets 7–13, oblong or oblanceolate, lateral opposite. Legume oblong, 2-seeded, or casually 1-seeded.

157. I. subulifera Welw. ex Baker, *l. c.* p. 96 (1871); Hiern, *l. c.* p. 215.

Hab. Lower Guinea. Pungo Andongo, *Welwitsch*, nos. 2048! 2048*b*! 2049! Huilla, *Welwitsch*, nos. 2050! and 2050*b*!

(j^1) Shrubs with 9–19 opposite leaflets, turning blackish when dried. Calyx short. The indigo-yielding species.

⊙ Leaflets oblong or obovate. Legume sickle-shaped, 6–8-seeded.

158. I. suffruticosa Miller, Gard. Dict. ed. viii. no. 2 (1768).

I. Anil Lin. Mant. ii. p. 272 (1771); Baker, *l. c.* p. 98; Hook. f. Bot. Mag. t. 6506.

I. uncinata G. Don, Gard. Dict. ii. p. 208 (1832).

I. micrantha Desv. in Ann. Sc. Nat. Ser. 1, vol. ix. p. 410, *fide* Hook. fil.

Hab. One of the species commonly cultivated.

⊙⊙ Leaflets oblanceolate. Legume straight, 6–8-seeded.

159. I. ARRECTA Hochst. in Schimp. Hb. Abyss. no. 1923; Baker, *l. c.* p. 97 (1871), non Benth.

I. umbonata Welw. ex Baker, *l. c.*

I. Anil Guill. & Perr. Fl. Seneg. p. 180 (1831–33).

Hab. This is the chief indigo-producing species in Africa outside the area occupied by *I. articulata* Gouan.

⊙⊙⊙ Leaflets elliptical. Racemes 8–10 cm. long. Legumes almost straight, glabrous, 1·25–1·50 cm. long.

160. I. LONGERACEMOSA Boivin ex Baillon in Bull. Soc. Linn. Par. i. p. 399 (1883).

I. tinctoria L. var. *brachycarpa* Vatke in Oesterr. Bot. Zeit. (1878), p. 214, non DC.

Hab. EAST TROPICAL AFRICA. Zanzibar, *Hildebrandt*, no. 941!

⊙⊙⊙⊙ Leaflets oblong or obovate. Racemes shorter than the leaves. Legumes straight, or nearly so, 2·5–4 cm. long, 8–12-seeded.

161. I. TINCTORIA L. Sp. Pl. p. 751 (1753); Wight, Icones, ii. t. 365 (1843); Baker, *l. c.* p. 99.

I. indica Lam. Encyc. iii. p. 245 (1789).

I. ornithopodioides Schum. et Thonn. Pl. Guin. p. 372 (1827).

I. Bergii Vatke in App. Ind. Sem. Berol. p. 3 (1876).

I. orthocarpa Baker, *l. c.* non Presl.

Hab. Widely cultivated. Wild in Senegambia, and perhaps elsewhere.

This is the "Indigofera leguminibus arcuatis incanis, racemis foliis brevioribus" of Linnæus, Fl. Zeylan. p. 125, and there is a good specimen in Hermann's herbarium, vol. iii. p. 20, in which the axillary racemes are much shorter than the leaves.

⊙⊙⊙⊙⊙ Leaves oblong or oblanceolate. Legume oblong, 6–10 mm. long, 2-seeded.

162. I. KISANTUENSIS De Wild. & Dur. in Bull. Herb. Boiss. 2nd ser. i. p. 13 (Dec. 1900).

Hab. LOWER GUINEA. Congo Region, Kisantu, *J. Gillet*, no. 839.

⊙⊙⊙⊙⊙⊙ Leaflets oblanceolate, oval or oblong. Legume short, 5–7 mm. long, glabrous, 2–3-seeded.

163. I. AMORPHOIDES Jaub. & Spach. Illus. Pl. Or. t. 483 (1853–57); Baker, *l. c.* p. 97.

I. abyssinica Hochst. in Schimp. Pl. Abyss. no. 2213.

I. alta Schweinf. Fl. Æthiop. p. 11 (1867).

Hab. NILE LAND. Abyssinia, near Gageros, *Schimper*, no. 2213! Near Awarra, *Schimper*. Eritrea, *Schweinfurth*. SOMALILAND. Upper Sheik, *Mrs. E. Lort Phillips*!

(k^1) Shrubs with 7–11 elliptical or obovate leaflets, lateral opposite, not turning black in drying. Legume 6–8-seeded.

⊙ Legume nearly straight, 1·2–2 cm. long.

164. I. EMARGINELLA Steud. in Schimp. Hb. Abyss. no. 735; Baker, *l. c.* p. 99; Hiern, *l. c.* p. 216.

I. coluteifolia Jaub. & Spach, *l. c.* t. 437–8.

Hab. NILE LAND. Abyssinia, *Schimper*, no. 735! no. 1723! Niamniamland, *Schweinfurth*. no. 3900! LOWER GUINEA. Angola, Pungo Andonga, *Welwitsch*, no. 2016! BRITISH CENTRAL AFRICA. Nyassaland, *J. Buchanan* (1891), no. 756! (1896), no. 93! Shire, *J. Buchanan*, no. 2!

⊙⊙ Legume deflexed, glabrous, 2·2–3·2 cm. long.

165. I. MACROPHYLLA Schum. Pl. Guin. p. 372 (1827); Baker, *l. c.* p. 100; Hiern, *l. c.* p. 216.

Hab. UPPER GUINEA. Senegambia, *Heudelot*, no. 603! Guinea proper, *Thonning*, *Barter*. Sierra Leone, *Afzelius*! Near Kafogo, *Scott Elliot*, no. 5502! Near Kitchom, *Scott Elliot*, no. 4320! LOWER GUINEA. Angolo, Pungo Andongo, *Welwitsch*, no. 2013!

[I. OLIVERI Schweinf. in Engler, Hochgebirgsflora, p. 259 (nomen) (1892); in App. Von Hohnel, zum Rudolph See p. 866 (1892).

Hab. EAST TROPICAL AFRICA. Masai Highlands, Kikuyu, near N'doro, *Von Hohnel*, no. 75 (137).

Said by Schweinfurth to be allied to *I. macrophylla*, but he gives no description.]

(l^1) Suffruticose. Leaflets 9–11, oblong or obovate, lateral opposite. Legume subfalcate, ∞-seeded.

166. **I. longemucronata**, sp. nov. Suffrutex. Caulis lignosus tenuis teres ramosus glaber. Folia imparipinnata foliola oblonga vel obovata 4–5-juga superne glabra vel glabriuscula subtus albo-strigosa costa supra impressa, foliolis lateralibus oppositis brevissime petiolulatis quam terminalibus paullo minoribus vel subæqualibus. Racemi quam folia multoties longiores laxiuscule floriferi. Flores speciosi. Calycis tubus brevis lobi lineari-lanceolati quam petala subtriplo breviores inæquales. Antheræ brevissime apiculatæ. Legumen subfalcatum polyspermum longe mucronatum glabrum vel subglabrum.

Hab. EAST TROPICAL AFRICA. Giryama and Tsimba Mts., *Rev. W. E. Taylor*, 1887, in Herb. Mus. Brit.!

Terminal leaflets 7 mm.–1·1 cm. long. Racemes 5–15 cm. long.

(m^1) Suffruticose. Leaflets 20–25, obovate or cuneate. Raceme subsessile, shorter than the leaves. Legume curved, 6-seeded.

167. I. HOFMANNIANA Schinz in Verhandl. Bot. Brandenb. XXX. p. 162 (1888).

Hab. LOWER GUINEA. Amboland, Omikangua.

Allied to *I. tinctoria*.

(n^1) Suffruticose ?. Leaflets 11–13, lanceolate-oblong, oblong, or obovate-oblong, lateral opposite. Ovary with about 12 ovules.

168. I. LONGIFLORA Taubert in Pl. Ost.-Africa, Engl. Theil c. p. 210 (1895).

Hab. EAST TROPICAL AFRICA. Mozambique, *Stuhlmann*, no. 871.

(o^1) Suffruticose. Leaflets 11–19, oblong. Racemes about equalling the leaf.

169. I. MACRANTHA Harms in Ann. Ist. Bot. Roma (1897), p. 91.

Hab. GALLA TERRITORY between Alghe and Oi, *Riva*, no. 1313.

Noticeable on account of its large flowers, brownish indumentum, and long raceme.

(p^1) Copiously branched, viscid, perennial herb. Leaflets 11–19, oblong, lateral opposite. Racemes 12–20-flowered. Legumes ∞-seeded, densely clothed with stalked glands.

170. I. VISCIDISSIMA Baker, *l. c.* p. 100 (1871); Hiern, *l. c.* p. 216.

Hab. LOWER GUINEA. Huilla, *Welwitsch*, no. 2042 !

(q^1) Shrubs or suffrutices with numerous (13–23) leaflets, not generally turning black on drying.

⊙ Leaflets subcoriaceous, lanceolate or oblong-lanceolate, 10–12 mm. long. Racemes 3·0–4·0 cm. long. Legumes straight, 3·7–4·5 cm. long, 12–15-seeded.

171. I. SUTHERLANDIOIDES Welw. ex Baker, *l. c.* p. 101 (1871); Hiern, *l. c.* 217.

Hab. LOWER GUINEA. Angola, Huilla, *Welwitsch*, no. 2012 !

⊙⊙ Leaflets oblong or subobovate, 20–30 mm. long. Legumes linear, mucronate, 3·5–4·0 cm. long.

172. I. FULGENS Baker, *l. c.* p. 101 (1871).

Hab. EAST TROPICAL AFRICA. Banks of the Rovuma, *Kirk* !

⊙⊙⊙ Leaflets obovate or oblong, 5–13 mm. long. Racemes 3–12 cm. long, longly peduncled. Legume ± 3 cm. long, 8–12-seeded.

173. I. GILLETII De Wild. & Dur. in Bull. Herb. Boiss. 2nd ser. i. p. 13 (Dec. 1900).

Hab. LOWER GUINEA. Congo Region, Kisantu, *J. Gillet*, nos. 583–737–881.

⊙⊙⊙⊙ Leaflets oblong, 6–17 mm. long. Racemes 2–3 cm., shortly peduncled or subsessile. Legume straight, 2·0–2·5 cm. long, 8–10-seeded.

174. I. SCOPA De Wild. & Dur. in Reliq. Dewevre, i. p. 60 (1901).

Hab. LOWER GUINEA. Congo Region, Lussanga, *Dewevre*, no. 1027 *b*.

⊙⊙⊙⊙⊙ Leaflets oval, 7·5–10 mm. long. Racemes 3·7–9 cm. long. Legume straight.

175. I. SPLENDENS Fic. & Hiern in Trans. Linn. Soc. 2nd ser. vol. ii. p. 19 (1881).

Hab. EAST TROPICAL AFRICA. Upper course of the River Ninda, *Serpa Pinto*, nos. 1 & 4.

⊙⊙⊙⊙⊙⊙ Leaflets oblong. Racemes 2·5–3·7 cm. long. Legume 2·5–3·2 cm. long, straight, 5–6-seeded.

176. I. Lyallii Baker in Journ. Linn. Soc. xx. p. 128 (1883); Baker fil. in Trans. Linn. Soc. vol. iv. 2nd ser. p. 9 (1894).

Hab. British Central Africa. Nyassaland, Mount Milanji, *Whyte*!

⊙⊙⊙⊙⊙⊙⊙ Leaflets oval, or oblong, or obovate-oblong, 15–25 mm. long. Racemes 2·5–5·0 cm. long.

177. I. Baumiana Harms in Kunene Sambesi Exp. p. 257 (1903).

Hab. Lower Guinea. Angola, Habungu, *Baum*, no. 497! Quiriri, *Baum*, no. 819.

§§§§ Amecarpus. Pods linear, flattened, bi- or multi-ovulate, unarmed.

(*a*) Leaflets 3–5, oblong, or elliptical, or obovate-oblong. Legume generally ± curved, 5–12-seeded, excentrically acuminate, 2–2·75 mm. in diam.

178. I. anabaptista Steud. Nom. ed. ii, i. (1840), p. 805; Chiov. in Ann. Ist. Bot. Roma (1903), p. 87.

I. ornithopodioides Hochst. & Steud. apud Schimper, Pl. Arab. Unio Iter (1837), no. 769; Jaub. & Spach, Illus. Pl. Or. t. 480, non Schum. & Thonn. nec Cham. & Schlecht.

I. Hochstetteri Baker in Fl. Trop. Afr. ii. p. 101 (1871).

I. Jaubertiana Schweinf. in Bull. Herb. Boiss. 1876, App. ii. p. 245.

I. senegalensis Kotschy, It. Nub. no. 19, non Lam.

Elasmocarpus ornithopodioides Hochst. apud Schimper, Pl. Abyss. no. 2463.

Hab. Nile Land. Widely spread in Abyssinia, Nubia, Eritrea, &c. Lower Guinea. Loanda, *Welwitsch*, nos. 4137–4138–4139–4140–4141!

Dr. Schweinfurth (in Bull. Herb. Boiss. 1896, App. p. 245) considers it advisable to retain *I. Jaubertiana* Schweinf. (=*I. ornithopodioides* Hochst. & Steud.) as distinct from *I. anabaptista* Steud.

(*b*) Leaflets 3–5, elongate. Racemes (fruiting) longer than the leaves. Legume incurved, 4–5-seeded, hirsute, ± 2 mm. diam.

179. I. oligophylla Klotzsch in Peters' Mossamb. p. 49 (1862); Baker, *l. c.* p. 102.

Hab. East Tropical Africa. Island of Goa, *Peters*.

(*c*) Leaflets 3–5, linear or linear-oblong, acute. Legume narrow (less than 2 mm. in diam.), almost straight, 10–12-seeded.

180. I. aspera Perrottet ex DC. Prod. ii. p. 229 (1825); Fl. Senegal, i. 184; Baker, *l. c.* p. 102; Hiern, *l. c.* p. 217.

I. linearis, DC. Prod. ii. p. 228, *fide* Hiern.

Hab. Nile Land. Nubia, *Kotschy*, no. 375! Upper Guinea. Senegal, *Perrottet*! *Heudelot*, no. 428. Jeba, on the Kworra, *Baikie*! Lower Guinea. Mossamedes, *Welwitsch*, nos. 2036–2036*b*!

(*d*) Leaflets 5–7, obovate or spathulate-oblong. Legume oval, or oblong, or ovate, straight, 2–5-seeded, 3–4 mm. in diam.

181. I. ARABICA Jaub. & Spach, Illus. Pl. Or. t. 479 (1853–57).

The type is from Arabia (Mount Maammara, Yemen). The plant recorded in Fl. Trop. Afr. ii. 103, under this name, from the banks of the White Nile, differs in the legumes, and is probably *I. semitrijuga*.

(*e*) Leaflets 3, rarely 5, oblanceolate. Legume subelliptical, hairy, acuminate, ± 2-seeded, 3–4 mm. in diam.

182. I. ERVOIDES A. Rich. Fl. Abyss. i. p. 179 (1847); Baker, *l. c.* p. 103.

Elasmocarpus ervoides Hochst. ap. Schimper, Pl. Abyss. (without number).

Hab. NILE LAND. Abyssinia, *Schimper*, no. 1545 ! (1863–8); *Quartin-Dillon* !

The plant from Assaorta referred here by Dr. Chiovenda (Ann. Ist. Bot. Roma, 1903, p. 89) seems doubtful, as the legumes are 1–5-seeded.

(*f*) Leaflets 3–7, linear or linear-lanceolate. Legumes deflexed, straight, 3–4-seeded, ± 2·5 mm. in diam.

183. I. SENEGALENSIS Lam. Dict. iii. p. 248 (1789); DC. Prod. ii. p. 228; Guill. & Perr. Fl. Seneg. p. 183 (1832–3).

I. tenella Schum. & Thonn. Pl. Guin. p. 367 (1827).

Brissonia trapezicarpa Desv. in Ann. Sc. Nat. ser. i. ix. p. 409.

Hab. UPPER GUINEA. Senegambia, *Perrottet* ! *Heudelot*. SOMALILAND. Dolo, *Riva*.

(*g*) Leaflets 3–7, narrow, lanceolate, acute. Racemes axillary, ∞-flowered, shorter than the leaves. Legume — 10-seeded, 1·5–2·0 mm. in diam.

184. I. SCABERRIMA Schinz in Verhandl. Bot. Brandenb. XXX. p. 163 (1888).

Hab. LOWER GUINEA. South-east Amboland, Oombale, *Schinz* ! Herb. Kew.

(*h*) Leaflets 5–7, elliptical. Racemes ± 12-flowered. Legume linear, straight, apex only incurved, polyspermous.

185. I. THEUSCHII O. Hoffm. in Linnæa (xliii), p. 126 (1881).

Hab. LOWER GUINEA. Angola, Pungo Andongo.

Allied to *I. aspera*; differing by shorter leaves, calyx divided to the middle, and few-flowered racemes.

(*i*) Annual. Leaflets 7, linear or narrow linear. Racemes laxly many-flowered, longer than the leaves. Legumes elongate, — 10-seeded, 1·5–2·0 mm. in diam.

186. I. CHARLIERIANA Schinz in Verhandl. Bot. Brandenb. XXX. p. 165 (1888).

Hab. LOWER GUINEA, AMBOLAND. Olukonda, *Schinz* !

Species non satis notæ et exclusæ.

I. albicans R. Br. in Salt App. p. 65, nomen = *Tephrosia nubica* Baker.

I. angolensis D. Dietr. Syn. Pl. iv. p. 1036.

I. clitorioides G. Don, Gen. Syst. ii. p. 206.

I. emarginata G. Don, *l. c.* p. 209.

WAYFARING NOTES FROM THE TRANSVAAL.—III.

By R. Frank Rand, M.D., F.L.S.

Johannesburg: March 16, 1903.—Writing in autumn, one may look back upon the weather conditions which have prevailed during the past summer. One notes that, even in summer, when rains and thunderstorms are frequent, the relative humidity continues to be low. The difference between the dry and wet bulbs of the thermometer is usually at least 10° Fahr., frequently more, this with the dry bulb temperature in the neighbourhood of 80° Fahr. Thunderstorms and rain show a tendency to beat up towards evening, the mornings being mostly fine.

When one considers the altitude, about 5,700 ft., the high temperature, the air-movement, the situation, typically continental, one realizes how enormous must be the transpiration from a leaf of the ordinary type, *i.e.* with expanded blade. Such a type of leaf, unless protected with thick epithelium or other impervious covering, could scarcely exist; and one finds such leaves therefore restricted to shady, sheltered, and moist situations.

The plants of the open veld guard themselves against excessive transpiration in one or other of the well-known ways, or by a combination of them. Briefly, by narrowing the area of their transpiration surfaces, reducing the number of their stomata, and by thickening their coats and their juices.

The narrow, linear type of leaf, often with rolled edges, abounds in many different orders, for it has the advantage that it offers little surface to the wind. The lithe stems of these linear-leaved plants dip before the wind in the way so familiarly seen in the grasses. Species succeed species as the summer months go by, and the outward bearing of many which appear later so much resembles that of others whose period of flowering is past, that at first glance they might be mistaken for them. There is no shelter upon the open veld for peace-loving plants such as at home find haven along hedgerow and ditch.

Some few miles from Johannesburg one can get glimpses of conditions less harsh than those of sandstone ridges. At Witpoortje Kloof, some few miles to the westward, a small stream breaks from the divide and courses northward. At first fringed with bog, it soon cuts its way by a ravine through the series of bold ridges of sandstone and shale which here intervene between the divide and the

granite, affording a magnificent series of natural sections. By the stream there grow, among other water-loving plants, several very fine tree-ferns (*Cyathea Dregei* Kunze (1174)), here well sheltered.

Early in November, 1902, I wrote, "The flowers of Vellozia have come and gone"; this was true of that detachment, but a fresh batch of flowers opened out after a month's interval, and these succeeded in setting seed. Probably the time of flowering of Vellozia is dependent upon rainfall. A note as to the stamens of this species of Vellozia may be of interest. The filaments are much flattened and connate below. The great bulk of the stamen is made up of a white, fleshy connective, to which the loculi form a rounded, swollen border, except at the tip where the connective stands free as a projecting point. Dehiscence is by a regular line along the outer margin of the long loculi. This margin folds inwards in the later stages of the flower, so that dehiscence is practically introrse.

Some Gladioli, which I thought had passed, again appeared towards the end of November. The bright crimson one, a small-flowered species (1094), was only found in rocky places among the sandstone ridges. The three long anthers stand side by side like the stumps of a wicket, the loculi facing anteriorly, in which direction they dehisce. The style stands behind them in the early stages of the flower and apart. In the later stages of the flower the stigmas stoop forward among the anthers, disarranging the wicket. In the autumn season there are several seeds which are much in evidence, *e.g.* the feathered achenes of *Clematis Stanleyi*, arranged in a mop-like ball; the glistening, silky plumes of various Asclepiads, which upon sunny windy days are very striking; and the seeds of the various grasses.

One is tempted to ask why some of the follicles of the *Asclepiadaceæ* should be inflated, others not. One may fairly assume that the air-chamber serves as a non-conductor and is protective. The follicle is very usually borne erect and freely exposed. It seems possible that the heat of midday may increase the tension within the capsule from expansion of the contained air, and this, combined with the wind-factor, may determine the moment at which the capsule bursts. The inflated capsule, which is moreover sometimes winged, presents an extended surface to the wind. One notes that in various species the stalk of the follicle, sharply bent, lies close to the flattened axial side of the follicle, the outer side of the follicle being more bulging and gibbous, or it may form a bracket-like curve. The attachment of stalk to follicle is broad and firm. If pressure be exercised by the wind, or, as may be imitated by the finger, upon the inner flattened side of the follicle, so pushing it away from the vertical segment of the stalk, the broad base of attachment presses in upon the follicle and bursts it open along the suture upon the gibbous side, by a mechanism similar to that exercised in shelling peas. Once open, the silky hairs of the seeds dry up, but as they remain attached by their tips their expansion causes a bow-like bulging between root and tip which lifts them

and the seed free from the central column. Finally, the tips are detached and the seed set entirely free. The seeds cannot be destined to be carried for very long distances, as the plume is readily detachable.

It is difficult to see what function can be fulfilled by the more or less shreddy or fleshy eminences which stud the external surfaces of some follicles; they may be mere relics of a past time.

The following notes have reference to various Asclepiads sent; they were jotted down in odd moments, and mostly relate to characters which it was thought might not be so obvious in the dried specimens. Examination of such species as have been met with here convinces me that the valves upon either side of the slit which overlies the stigmatic chamber are essentially pistillar in structure; they are therefore referred to in the following notes as *stigmatic valves*. A low power of thirty magnification was used when necessary, except where otherwise stated.

Parapodium costatum E. Mey. (965).—Petals erect, fleshy, dull-coloured. Cuculli short, white, fleshy, forming cup-like hollows which occupy the floor of the flower and secrete honey. Their upper edges form a rim standing well away from the column, and as a consequence the stigmatic valves, which project strongly, are very conspicuous. The stylar head forms a pinnacle-like cone above the anthers, whose membranous tips clasp its sides below. The *pollinia* are very large, flattened, and of a rudely long-oval figure. The *retinacula* short, darker in colour than the pollinia, flattened and stout. × 250; the rough hexagonal epithelial cells, which, looked down upon, show a double contour, show in profile a serrated outline. They suggest the skin of a duck's leg, and constitute the clasping surface. The *corpusculum* is long with a beak-like projection at the upper end.

Dichælia microphylla S. Moore (967) (see p. 312).—An inconspicuous plant, growing among sandstone rocks. The valves of stigmatic chamber have everted edges. The corpusculum is inferior. Pollen-masses oval, laterally compressed. Retinacula short and stout.

Schizoglossum pulchellum Schlechter (962).—Corolla greenish. Cuculli horned, each horn with two small lateral processes upon either side of the base. Pollinia sausage-like, not flattened, inner margin of each mass of concave outline, outer margin convex. Retinacula short and thick. The valves of stigmatic chamber form a gaping mouth below at the *angle*, a term which may coveniently designate the point at which the valves change from the perpendicular to the horizontal direction in their retreat back to the column. The mouth is directed slightly upwards, its lips everted. Inner margins of stigmatic valves beset with fine teeth directed inwards. The lateral portion of the membranous anther-tip is inflated below, and continued downwards upon either side of the cucullar horn. It is noteworthy that, even in the flower, section shows quite clearly the emergences upon the external walls of the carpels.

Schizoglossum guelense N. E. Br. (1009).—Erect habit. Green,

rotate petals. Cuculli white, sometimes reddish purple, bearing at their apices a long double process, one within the other; they arch up over the stylar head and form with their fellows of the other cuculli a double cage-work or lantern above it. The body of the cucullus is shouldered, and at each shoulder is a short incurved horn. As to the pollinia: their retinacula are kneed. The part of pollinium adjacent to the insertion of the retinaculum is flattened, the rest of the mass is sausage-shaped. The flattened portion appears to be free from pollen-grains. The valves of the stigmatic chamber form the usual slit above; below they diverge and form a wide, shallow, gaping mouth with everted lips. They converge again, and then again dilate to approach again before finally merging with the column. The edges of the slit throughout are thick and tumid. On section fine teeth are to be seen within the margins of the valves. In this species and in several others, although it is not by any means a general case, one sees the slippery surface characteristic of the anther-tips continued down upon the outer walls of the stigmatic chamber as far as the gaping mouth of the slit.

Asclepias fruticosa L. (1128).—Flowers in pendulous umbels. Left margin of petal hairy throughout its length. In the bud the petals more lightly coherent at their tips than at their sides. Pollinia flattened, of fly-wing shape. Retinacula kneed. × 300; one notes that the rough epithelial clasping cells are continued outwards for a short distance upon the body of the pollen-mass. The valves of the stigmatic chamber project strongly below, and form a gaping area of lenticular outline. Below this gaping portion the valves approach, to again diverge before being lost upon the walls of the cuculli. Note.—Where the cuculli are restricted to the upper part of the column, which thus comes to be unencumbered below, one often finds a pendulous umbel. In an example of this species examined, an imported pollinium was found held fast. One pollen-mass of the pair was found wedged firmly into the stigmatic chamber, which, as in so many cases where the pollinium is flattened, was of narrow lenticular section. The thin edge of the pollen-mass reached quite close up to the inner wall of the chamber where it abuts upon the carpels. The other pollen-mass of the pair, with corpusculum and retinacula, projected outside the valves. The pollen-mass becomes cloudy, its walls rupture, and it appears that the grains thereafter, or their pollen-tubes, diffuse themselves amid the loose cellular tissue of the stylar head, which indeed sometimes appear tinged with yellow, I suspect from this circumstance.

Asclepias eminens Schlechter (1008).—Procumbent habit. Corolla pale green. Cuculli long, erect, nearly twice the height of the column, which they surround like pillars, the salient valves of the stigmatic chambers projecting between them. They are hollowed at their summits with a tooth-like projecting spur in the median line. Viewed in profile the valves of the stigmatic chamber form a convex outline, and about the junction of the middle with the lower third is a slightly gaping mouth with everted lips. The valves are horny in texture, their inner walls studded with fine

teeth, especially in the upper parts. Section of the stigmatic chamber shows it to be very narrow—as usual where the pollinium is of fly-wing type. The pollinia are large, flattened, each mass tapering towards its narrow point of attachment to the retinaculum. Retinacula kneed and flattened at the knee in a plane at right angles to the flattening which obtains upon the proximal and distal sides of it. A curious, delicately-arched, thread-like process passes from the retinaculum to the pollinium.

Asclepias Calceolus S. Moore (966) (see p. 312).—Valves of stigmatic chamber salient below, receding in a curved line back to the column. There is an orifice at the *angle*. In profile the valves resemble a hooked nose. Pollinia flattened, of fly-wing type. Retinacula kneed, with well-marked warty, clasping-surface, and stouter near the point of insertion to corpusculum.

Schizoglossum propinquum S. Moore (860) (see p. 311).—Petals brownish. Cuculli simple and foliar. Lateral edges below have a thickened ridge which flanks an avenue of approach to the stigmatic slits, completed upon the opposite side by that of adjoining cucullus. The pollinia are only slightly flattened. Retinaculum kneed at a point close to its insertion into pollinium. The stigmatic slits dilate into a lenticular-shaped opening below. Stigmatic valves not markedly salient. A distinct slippery surface over outer walls of the anther-loculi. The membranous tips of the anthers have a crater-like ending inferiorly, over the edge of which the insect's foot, in slipping, is plumped into the slits lying below.

Xysmalobium undulatum R. Br. (1120).—Latex very abundant. Flowers dull green ; cup-shaped. Free segments of petals bearded along the margin. Cuculli dull-white in colour, short, thickened upon their inner faces along the median line, tinged with purple externally. They stand well away from the column. Stigmatic valves horny, projecting strongly below, where they form a nozzle-like oval opening at the *angle*, whence they retreat back to the column, giving a gargoyle-like effect in profile. The valves finely toothed within, the teeth pointing inwards. Stigmatic chambers narrow in section. Pollinia flattened, of fly-wing type. Retinacula not kneed, but flattened and twisted upon themselves. Clasping surface warty. × 300 ; the hairs of corolla show surfaces covered with fine clear rod-shaped markings disposed in a left-hand spiral around the circumference of the hair.

Asclepias densiflora N. E. Br. (968).—Stigmatic valves horny, salient below, the *angle* turning at about 90°. Pollinia of fly-wing type. Retinacula kneed, the corpuscular half being stouter than the pollinial half. They are twisted upon themselves through a half-turn. Stigmatic chambers lenticular in section. This example is interesting in that the antherial portion of the column being dark-coloured and the stylar and stigmatic portions coloured green, one is able to trace by what may be regarded as a piece of natural differential staining the extent to which the staminal and pistillar elements take part in its formation. A horizontal section at about the middle of the height of the column, × 30, shows the main mass of the column to be constructed of pistillar tissue. Upon the

external surface of the mass are five shallow hollows, which constitute the inner walls of the loculi. To these hollows the antherial portion of the column is applied externally, forming the external walls of the loculi, the dissepiment between, and, according to the height at which the section is made, showing more or less encroachment upon the inner walls, which are, however, in the main formed by the pistillar element. Alternating with the five shallow pits lodging the anthers are five narrow lenticular cavities, the stigmatic chambers, these lying behind the stigmatic slits. One sees the green stigmatic tissue running out for a considerable distance upon the inner walls of the valves, forming a papillary lining. The outer surface of the valve, epidermal for the most part, pertains to the stamen. Nearly opposite the *angle* of the stigmatic valves the green cells are seen to form a single columnar layer, whose free ends form the papillæ lining the stigmatic cavity, which at this level presents a more oval section. Axially the carpels are to be seen lying in a clear, transparent, loose cellular mass; external to this is a sharply-defined green portion of the column, which in its turn is bounded externally by a deeper-coloured layer of columnar cells, which, opposite the stigmatic cavities, come closely up to the layer lining the stigmatic cavity, but do not actually touch it.

Schizoglossum Randii S. Moore (1058) (see p. 310).—Corolla pale green; the lobes forming a cup. Cuculli white, each with a flattened horn from the face. Each horn rises up above the stylar head, over which the five meet, lying in contact with it. The cuculli bear on either side a small lateral process, which forms, with that of adjoining cucullus, an avenue of approach to the stigmatic slit. The stigmatic valves gape below. Pollinia ovate, the inner margin nearly straight, the outer convexly curved. Retinacula with broad attachment to the inner face of the pollen-mass; very short, not kneed. Inner margins of stigmatic valves show a few scattered teeth. Walls of stigmatic valves thick and tumid. The corpusculum is seen to be formed of two lateral wing-like pieces inturned at their margins; they meet above in the middle line but not below, so that one can see into the enclosed hollow. It seems probable that these in-turned pieces, which recall a half-opened mussel-shell, act like a spring. *In situ* they are in a state of tension, being kept upon the stretch by the pollen-masses still in their places in the loculi. As soon as the pollinia are drawn out, the spring, coming into play, clamps the pair of pollinia firmly upon the insect's leg; the tuberculated surface of the clasping area of the retinaculum aiding the grip.

Asclepias sulphurea Schlechter (1046).—Prostrate habit. Flowers green, agreeably scented. Cuculli dull-yellow, simple, globose, hollow. Pollinia slightly flattened and approaching fly-wing type. Retinacula slender, kneed close to pollinium. Stigmatic valves, thin-edged, gaping below, where the edges are everted. No marked salience viewed in profile.

Xysmalobium Brownianum S. Moore (1053) (see p. 309).—Habit erect. Corolla-lobes green, lanceolate, with everted edges. Cuculli

whitish, tinged with purple, simple, spathulate, with a point. Edges of cuculli in apposition, except for a notch below, which, with the corresponding notch upon the cucullus adjoining, gives access to the stigmatic chink. Stigmatic valves short from above downwards, salient. Pollinia large, flattened, of fly-wing type. Corpusculum small. Retinacula stout, irregularly flattened, and with well-defined clasping surface. Stigmatic chambers narrow in section.

Tenaris chlorantha Schlechter (1121).— Habit erect. Sepals small. Petals long, strap-shaped, brown-purple in colour. Cuculli simple, continued up over stylar head, swollen and glandular at their tips. The pollinia almost globular in shape, and lying freely exposed in shallow pits at the top of the column, portions of the stylar head appearing between them. The corpusculum *inferior*. Stigmatic valves small, with tubular trumpet-lipped orifice below. The detached leg of an insect found imprisoned in one specimen examined.

Asclepias cultriformis Schlechter (1126).—Petals green. Cuculli large, white, tinged with purple, the superior lateral angles arching up as slender processes above the stylar head. Lower portion of column stands free, a raised collar-like ridge surrounding the base of each cucullus. Stigmatic valves strongly projecting, forming a tubular orifice below. Pollinia large, flattened, rudely triangular in shape, being broad distally, narrow at their attached ends. Retinacula long and kneed near to the corpusculum.

Asclepias albens Schlechter (1119). — Habit decumbent, the branches radiating outwards. The umbels at first face downwards, but as the flowers mature the branches lift themselves up so that the flowers come to face the light. Stigmatic valves projecting, with a tubular orifice below and a lenticular-shaped slit in the horizontal portion between orifice and the column. The surface of the carpels clothed with long hairs. Pollinia flattened, their edges rudely parallel, tapering rapidly at the attached end. Retinacula short, kneed at point of attachment to pollinia.

It may be added as a general note, that the anther-loculi being oval in cross-section, it follows that in the case of flattened pollinia these are only in contact with the locular walls, when mature, by their edges. The retinacula show much variation in different species—adaptations, as it would seem, to different insects. They are frequently kneed, but the point at which the bend occurs differs largely in different species. They are variously twisted and flattened, sometimes showing a turn through half a revolution; owing to this there must often be a measure of rotation when the pollinia are approximated, this doubtless giving surer hold. The pollen-mass may be flattened in only a portion of its extent, and doubtless it is this keel-like portion which first engages the stigmatic slit.

AGARICUS VERSICOLOR With.

By Worthington G. Smith, F.L.S.

In Withering's *Arrangement of British Plants*, ed. 3, vol. iv. p. 166 (1796), there is a description of an *Agaricus* under the name of *A. versicolor* which has been a puzzle to botanists ever since the time of publication, and, according to the most recent Floras, has never been met with since Withering's time.

For the purposes of identification, which is very easy, it is necessary to transcribe Withering's original description, and to note the modifications and alterations of subsequent authors.

Withering writes:—"Gills yellow-white, changing to dark red-brown; pileus greenish buff, scurfy, convex, edge turned in; stem white to brown; ring permanent.

"Gills decurrent, yellowish-white, changing when old to dark brown, 2 or 4 in a set. Pileus greenish-buff, scurfy, most so in the centre, convex, becoming flat with age, but the edge much curled in; 1 to 4 inches over. Stem solid, but spongy, white, changing to brown, thickest downward, 2 inches high, thicker than a swan's quill. Ring permanent. Root bulbous. This is a rare species. I found it only once, and then near the bridge at Edgbaston Park which goes over the stream that feeds the large pool. July, 1792."

Fries, in translating the above into Latin in 1821 for the *Systema Mycologicum*, vol. i. p. 286, rendered "pileus greenish-buff, scurfy," "pileo squamoso virescente brunneo." It is clear that Fries did not properly understand the English words "buff" or "scurfy"; perhaps they were not in his dictionaries.

Fries had sagacity enough to include the date, but he made the initial mistake of placing the plant under his subgenus *Psalliota*, next to *Agaricus æruginosus* Curt.

Berkeley next describes the plant in the *English Flora*, vol. v. Part II.—Fungi, p. 109, 1836. He partly gives the words of Fries, and uses the word "squamose," a translation of Fries, in place of Withering's "scurfy." He omits all reference to the bulbous stem with the persistent ring. He retains Fries's position of the plant next to *A. æruginosus* Curt. He omits the date, which Fries saw was important.

Fries, in his *Epicrisis*, 1836–38, p. 218, again describes the pileus as "squamoso" and "virescente-brunneo"; but he is evidently troubled about the pileus, for he adds, "viscoso?," and places "*bulboso*" in italics. He omits reference to the incurved edge of the pileus, and retains the plant in the position he first gave it. He now unwisely omits the date.

Berkeley, in his *Outlines*, 1860, p. 167, amends his own description, uses Withering's word "scurfy" instead of the erroneous "squamose," and refers to the bulbous stem and ring. Strange to say, he now alters Withering's "greenish-buff" into Fries's "greenish-brown," "virescente brunneo." He continues to omit the date.

Cooke, in his *Handbook*, vol. i. p. 140, 1871, copies Berkeley in part, but restores the erroneous word "squamose." He quotes

Withering, but describes the pileus as "greenish-brown," after Fries. He omits the date.

In his *Hymenomycetes Europæi*, 1874, p. 284, Fries returns to the plant, and still uses the words "squamoso" and "virescente-brunneo," and refers to the bulb and persistent ring. The date is omitted.

In Cooke's second and revised edition of his *Handbook*, 1883 (published June, 1887), at p. 193, *A. versicolor* is described, but now all reference to the colour of the pileus is omitted, as well as to the incurved margin. The "scurf" is referred to as "scales," and there is no date.

Stevenson describes the plant in his *British Fungi-Hymenomycetes*, vol. i. p. 309, 1886. He says the pileus is "scaly, the scales of the disc crowded," and as "becoming greenish-brown." The word "becoming" is a misleading addition to the erroneous colour-name. Perhaps Stevenson thought that, as the plant was named "*versicolor*," the pileus changed from an unknown colour to "greenish-brown"; or he might have translated Fries's word "virescente." But it happens that the colour of the pileus does not change colour. Withering only describes the gills and stem as becoming different in colour.

Mr. Massee's variations (*Brit. Fung. Fl.* i. 396, 1892) are best seen by contrasted characters:—

Massee.	Withering.
Pileus scaly.	Pileus scurfy.
Stem spongy stuffed, whitish then brownish.	Stem solid, but spongy, white changing to brown.
Gills pallid, then reddish-brown.	Gills yellowish-white, changing when old to dark red-brown.

Mr. Massee afterwards quotes part of Withering's description, omitting all the colours and the date. In Massee's *Eur. Fung. Fl.* p. 208, the characters of the *Brit. Fung. Fl.* are repeated in an abbreviated form.

The reason why *A. versicolor* With. has remained a "mystery" for more than a hundred years is because all the transcriptions since Withering's time have been faulty.

If the original description is carefully read, it will be seen that there is only one species of *Agaricus* to which it can possibly apply, —a somewhat small example of *A. melleus* Vahl. The very colour of the pileus, "greenish-buff," suggests *melleus*—honey colour—the pileus is usually "scurfy, most so in the centre" (not scaly), and the edge is at first "turned in." The gills are usually "decurrent," and in one well-known form (excellently illustrated amongst the Wheeler drawings at the British Museum) they change in colour from "yellowish-white" to "dark brown"; the stem is annulate, "white to brown," as described by Withering, and it is frequently bulbous. A good example with a bulbous stem is amongst the British Museum drawings. As regards the date—July—*A. melleus* often appears early in the season; it is common in August, whilst the majority of species do not appear till September or October.

BIOGRAPHICAL INDEX OF BRITISH AND IRISH BOTANISTS.

By James Britten, K.S.G., F.L.S., & G. S. Boulger, F.L.S., F.G.S.

Second Supplement (1898–1902).

This second supplement to our *Index* contains the records of botanists who have died from 1898 to 1902 inclusive, together with some accidental omissions from the work and its first supplement. Corrections and additions will be acceptable for inclusion in the reprint, should one be issued.

Aitchison, James Edward Tierney (1836–98): b. India, 28 Oct. 1836; d. Kew, Surrey, 30 Sept. 1898. M.D., Edin., 1858. F.L.S., 1863. F.R.S., 1883. Bengal Medical Service. Collected in India (1867–72), Afghanistan (1879–83). Contributed to Journ. Linn. Soc. 'Cat. of pl. of Punjab and Sindh,' 1869. Jacks. 389. Trans. Bot. Soc. Ed. xxi. 224; Kew Bull. 1898, 310. Proc. Linn. Soc. 1898–99, 40; Nature, 13 Oct. 1898; Journ. Bot. 1898, 463. R.S.C. vii. 16; ix. 21: *Aitchisonia* Hemsley.

Aldridge, John (fl. 1833–54): M.D., Dublin. Lect. Nat. Hist. and Chemistry, Dublin. Papers on Pollen in Journ. Bot. 1840–42. R.S.C. i. 40.

Alexander, Richard Chandler. [*See* Prior.]

Allen, Charles Grant Blairfindie (1848–99): b. Alwington, Kingston, Canada, 24 Feb. 1848; d. Hindhead, 25 Oct. 1899; bur. Haslemere. B.A., Oxon., 1871. 'Colours of Flowers,' 1882. 'Flowers and their Pedigrees,' 1883. 'Memoir' by E. Clodd, 1900, with portr. and bibliog. Journ. Bot. 1899, 496; 1900, 62. Dict. Nat. Biog. Supp. i. 36.

Allman, George James (1812–98): b. Cork, 1812; d. Parkstone, Dorset, 24 Nov. 1898; bur. Poole Cemetery. F.R.S., 1854. F.L.S., 1872, Pres. 1874–81. M.D., Dublin and Oxford, 1847. Prof. Bot. Dublin, 1844–5. Prof. Nat. Hist. Edinb., 1855–70. 'Vegetation of the Riviera,' in Baréty's 'Nice and its Climate,' 1882. Dict. Nat. Biog. Supp. i. 40. Proc. Linn. Soc. 1898–9, 41; Notes Bot. School, Trin. Coll. Dublin, 1901, 157. R.S.C. i. 48; vii. 24; ix. 33; xii. 10. Portr. at Linn. Soc.

[**Amann, J.**, a pseudonym of **Sulpiz Kurz.**]

Anderson, John (1833–1900): b. Edinburgh, 4 Oct. 1833; d. Matlock, Derbyshire, 15 Aug. 1900. Zoologist. M.D., Edinb., 1862. LL.D., 1885. F.R.S., 1879. F.L.S., 1862. Superintendent Calcutta Museum, 1865–86. W. Yun-nan, 1867–8 and 1875–6; collected 800 plants, in Calcutta Herb. and at Kew; Journ. Bot. 1873, 193. Dict. Nat. Biog. Supp. i. 46. Bretschneider, 692. Proc. Linn. Soc. 1900–01, 38. R.S.C. i. 63; vii. 30; ix. 42.

Apjohn, Mrs. (fl. 1855): Wife of Dr. James Apjohn, Prof. Chemis-

try, Dublin Univ. "A zealous collector and observer of British algæ." Ann. Mag. Nat. Hist. 2, xv. 335. *Apjohnia* Harv.

Archer, William (d. 1875): d. Tasmania, 1875. F.L.S., 1855. Of Cheshunt, Tasmania. Contrib. to Journ. Bot. 1843–5. Herbarium at Kew. 'Veg. Products in Exhibition, 1862.' "A zealous botanist and acute observer." Fl. Tasman. i. 263. Drew orchids for Fl. Tasman. Sent algæ to Harvey. R.S.C. i. 86 ('Value of hairs'). *Archeria* Hook. f. Jacks. 402.

Aveling, Edward Bibbins (1851–98): b. Stoke Newington, 1851; d. Sydenham, 2 Aug. 1898. D. Sc., London, 1876. 'Bot. Tables,' 1874. 'The Student's Darwin,' 1881; ed. 5, 1882. 'An Introduction to the Study of Botany,' 1891; ed. 2, 1897. Jacks. 53. Allibone Supp. i. 62.

Baddeley, John (1846–68): b. at sea, Bay of Bengal, 22 Jan. 1846; d. Edinburgh, 29 Feb. 1868; bur. Grange Cemetery. M.B., Edinb., 1867. Memb. Bot. Soc. Edinb. "Fond of practical prosecution of botany." Trans. Bot. Soc. Ed. ix. 309.

Bagot, William (Lord) (1773–1856): 2nd Baron of Bagots Bromley, Staff. b. London, 11 Sept. 1773; d. Blithfield, Staff., 12 Feb. 1856. F.L.S. D.C.L., Oxon, 1834. Contrib. to ed. iii. With. Arr. Bagnall, Fl. Staffs. 71. Dict. Nat. Biog. ii. 400. Gent. Mag. n. s. xlv. 422.

Baird, Rev. Andrew (1800–45): b. Eccles, Berwicksh., 16 Nov. 1800; d. Oldhamstocks, Haddingtonsh., 22 June, 1845; bur. Cockburnspath. Discovered *Senecio erucifolius* in Scotland. Bot. E. Borders, 110.

Barber, Mary E., *née* Bowker (fl. 1859–89). Of Grahamstown, S. Africa. Sister of J. H. Bowker. Collected in S. Africa, especially orchids; pl. at Dublin and Kew. Sent pl. to and corresponded with W. H. Harvey. Contrib. to Journ. Linn. Soc. x. xi. Thesaurus Capensis, i. 24. Fl. Capensis, i. 9*. R.S.C. vii. 85; ix. 118; xii. 48. *Bowkeria* Harv.

Barkly, Sir Henry (1815–98): b. Monteagle, Ross-shire, ?1815; d. S. Kensington, 21 Oct. 1898; bur. Brompton Cemetery. Governor of Brit. Guiana, 1848; Jamaica, 1853; Victoria, 1856; Mauritius (1863–70); and Cape (1873–7), where he collected *Stapelias*. F.R.S., 1864. K.C.B., 1853. G.C.M.G., 1874. Plants at Kew. Dict. Nat. Biog. Supp. i. 124. Symb. Antill. iii. 19. Baker, Fl. Maurit. 9*, 10*, ix. 124. Kew Bulletin, 1898, 335. R.S.C. xii. 49. 'Stapeliæ Barklyanæ' in Ic. Pl. 3rd S. vol. x. *Barklya* F. Muell.

Barratt, John (1797–1882): b. Little Hallam, Derbyshire, 7 Jan. 1797; d. Middletown, Connecticut, 25 June, 1882. M.D., Yale. Pupil of Torrey. Prof. Bot. Military Academy, Middletown, 1820–30. Worked at Willows; sent notes to W. J. Hooker for Fl. Bor.-Amer. 'Salices Americanæ,' 1840. 'North American Carices,' 1840. 'Eupatoria,' 1841. Jacks. 131, 358. R.S.C. i. 188; Sargent, Silva N. Amer. xiv. 64. *Barrattia* A. Gr. = *Encelia*.

Barrington, Right Rev. Shute (1734–1826): b. Becket, Berks., 26 May, 1734; d. London, 25 March, 1826. Bp. of Llandaff,

1769; Salisbury, 1782; Durham, 1791. Hon. F.L.S., 1812. M.A., Oxon, 1757. D.C.L., 1762. "Much devoted to study of Botany." Proc. Linn. Soc. 1888–9, 31. Dict. Nat. Biog. iii. 294. Bust at Linn. Soc.

Bartram, William (1739–1823): b. Bot. Garden, Kingsessing, Philadelphia, 9 Feb. 1739; d. same place, 22 July, 1823. Son of John Bartram. Drew plates for Barton's 'Elements of Botany' (pref. p. x). Elected Prof. Bot. Univ. Pennsylvania, 1782. 'Memorials of Bartram,' 288 and *passim*. 'Reliquiæ Baldwinianæ,' 230, 234, 238, &c. 'Travels through N. & S. Carolina,' 1791; MS. account of this journey and vol. drawings of plants and animals in Bot. Dept. Brit. Mus. Specimens in Herb. Mus. Brit. Jacks. 354. Pritz. 15.

Bennett, Alfred William (1833–1902): b. Clapham, Surrey, 24 June, 1833; d. London, 23 Jan. 1902: bur. Friends' Burial-ground, Isleworth. Son of William Bennett. M.A., Lond., 1856. B.Sc., 1868. F.L.S., 1868. Contrib. to Phytol., Journ. Bot., Journ. R.M.S., 'Flora Brasiliensis.' Translated and edited Sachs's 'Lehrbuch,' 1875 (w. W. T. T. Dyer), and Thomé's 'Lehrbuch,' 1877. 'Handbook of Cryptogamic Bot.', 1889, w. George Murray. 'Guide to Fl. of Alps,' 1886. Jacks. 521. R.S.C. vii. 127; ix. 189. Proc. Linn. Soc. 1901–2, 26. Journ. Bot. 1902, 113.

Berkeley, Emeric Streatfield (1823?–98): d. Bitterne, Southampton, Dec. 1898. Major-General. Son of Rev. M. J. Berkeley. Studied orchids in India. Orchid Review, 1899, 9. Gard. Chron. 1898, ii. 427. *Emericella* Berk.

Bingley, William R. (fl. 1838–9): Lists of Snowdonian plants on pp. 125–129 of 'North Wales,' ed. 3 (1839), by his father, Rev. William Bingley (q. v.). Journ. Bot. 1898, 14.

Black, Alexander Osmond (d. 1864?): Found *Alchemilla conjuncta* on Clova in 1853. Memorials of Babington, 323. Mosses, chiefly British, in Herb. Mus. Brit. "An active and very intelligent young botanist," Lindley. Gard. Chron. 1853, 724. Cyb. Brit. Supp. 34.

Bosisto, Joseph (d. 1898): b. Yorkshire; d. Richmond, Melbourne, 8 Nov. 1898. Pharmaceutist. W. Adelaide, 1848. Pharm. Journ. 1899, i. 71. R.S.C. i. 503; ix. 300. *Bosistoa* F. Muell.

Bowker, James Henry (fl. 1853–85). Colonel in Frontier Armed Police, S. Africa. F.Z.S. Collected in S. Africa; plants at Dublin and Kew. Sent pl. to and corresponded with W. H. Harvey; Thesaurus Capensis, i. 24; Fl. Capensis, i. 9*. Trans. S. African Phil. Soc. iii. 68 (1885). *Bowkeria* Harv.

Braine, C. J. (fl. 1844–1850): Merchant at Hongkong. Sent ferns from Hongkong and Chusan to Hooker; brought living plants to Kew, 1850; Bretschneider, Bot. Discov. in China, 383; Journ. Bot. 1850, 250. *Brainea* J. Sm.

Brotherston, Andrew (1834–91): b. Eccles, Berwicksh., 28 March, 1834; d. Kelso, 16 March, 1891. Gardener. Papers in Hist. Berwicksh. Nat. Club, 1873–1882. R.S.C. vii. 275; ix. 367. Hist. Berw. Nat. Club, xiii. 399; Trans. Bot. Soc. Ed. xxi. 279.

Brown, Robert (1839–1901): b. Liverpool, 27 Sept. 1839; d. Liverpool, 6 April, 1901. Pres. Liverpool Field Club, 1896–8. Revised 'Flora of Liverpool.' Contrib. to 'Flora of Cheshire. 'Notes on Flintshire pl.,' Journ. Bot. 1885, 357. Journ. Bot. 1902, 236.

Brown, Rev. Thomas (1811–93): b. Langton, Berwicksh., 23 Ap. 1811; d. Edinburgh, 4 April, 1893. D.D., Edinb., 1888. F.R.S., Ed., 1861. Bot. of Langton in New Statist. Acc. Scotland, 1834. Discovered *Saxifraga Hirculus* in Scotland. Hist. Berwicksh. Nat. Club. xiv. 339. R.S.C. i. 662; vii. 280; ix. 372.

Brown, William Lindsay (1842–1900): b. Kirkcudbright, 14 Oct. 1842; d. Kirkcudbright (?), 26 July, 1900. F.L.S., 1891. "A good botanist . . . left a very fine collection of plants, flowers, and lichens . . . never had time to publish anything." Proc. Linn. Soc. 1900–1, 42.

Burgess, Henry W. (fl. 1827–31): 'Eidodendron, views of the general character and appearance of trees,' fol. 1827 (text by G. Burnett). Portr. by W. C. Ross. Jacks. 495.

Bury, Mrs. Edward (fl. 1831–4): Of Liverpool. 'Selection of Hexandrian Plants' (plates), 1831–4. Pritz. 49. Jacks. 123.

Byam, L. (Miss) (fl. 1800): Of Antigua. 'A Collection of Exotics from the Island of Antigua' (plates). Schrader, Journ. Bot. iii. 440 (1800).

Carnegie, Hon. David (1871–1900): b. London, 1871; d. Nigeria, 27 Nov. 1900. North-west Australian pl. (coll. 1896) at Kew. 'Spinifex and Sand.' Kew Bulletin, 1901, 169. *Dicrastylis Carnegiei* Hemsl.

Carter, Henry John (1813–95): b. 1813; d. Budleigh Salterton, Devon, 4 May, 1895. F.R.S., 1859. Surgeon-Major, Bombay Army. Geologist and diatomist. 'Hildenbrandtia,' Journ. Bot. 1864, 225. R.S.C. i. 802; vii. 341; ix. 454; xii. 144.

Caruel, Teodoro (1830–98): b. Chandernagore, Bengal, 27 June, 1830; d. Florence, 4 Dec. 1898. Prof. Bot. Florence. Edited N. Bot. Giorn. Ital., 1872–93. 'Prodr. Flora Toscana,' 1860. Saccardo, 'La Botanica in Italia,' i. 46; ii. 28. N. Bot. Giorn. Ital. 2 s. v. 253. Jacks. 530. Pritz. 57. R.S.C. i. 805–6; vii. 343–4; ix. 457–8. Journ. Bot. 1898, 258.

Chalmers, James (d. before 1834): b. Dundee. "Manipulator" in Sir. W. J. Hooker's herbarium at Glasgow in 1827. Algologist. Published fasciculi of 'Algæ Scoticæ.' Ann. Bot. xvi. pp. xxxiii, cxx.

Christie, Joseph (1838–98): b. Kilmarnock, 1838; d. Glasgow, 8 July, 1898. Contrib. papers to Glasgow Eastern Bot. Soc. Trans. N. Hist. Soc. Glasgow, v. 300.

Clarke, Stephen (fl. 1820–22): Of Ipswich. 'The British Botanist,' 1820; 'Hortus Anglicus,' 1822; both published anonymously.

Cleveley, John (1747–86): Botanical artist. Draughtsman on Banks's voyage to Hebrides, 1772, and to Phipps' Arctic voyage, 1774. Prepared drawings for Banks of plants coll. on Cook's First Voyage. Dict. Nat. Biog. xi. 53.

(To be continued.)

ANTHOCEROS DICHOTOMUS IN BRITAIN.

By Symers M. Macvicar.

Anthoceros dichotomus Raddi in Act. Acad. Sien. ix. p. 289, t. 4 (1808). *A. polymorphus* var. γ *dichotomus* Raddi in Opusc. scientif. di Bol. ii. p. 359 (1818).

Monoicous. Fronds prostrate, with short irregularly divided segments in the fertile plant; segments in the sterile plant dichotomous, narrow, linear or oblong, channelled, with the margins ascending and sinuate, carinate postically, and with descending tubers at intervals proceeding from the costa; the costa without root-hairs or almost so, but which become developed later on the tubers. "Costa $\frac{1}{8}$–$\frac{1}{3}$ the width of the segment, 6–10 cells thick, the lamina mostly 2-stratose, involucre ·7–1 mm. wide, often enlarged at the irregularly 2–4-lobed mouth." "Capsules erect or slightly curved, 7·5–15 mm. long, often thickened towards the apex, spores yellow, becoming yellowish brown, rounded-tetrahedral, almost wholly smooth on both faces, 42–60 μ in maximum diameter, pseudo-elaters yellowish, of 1–4 irregular elongated cells, geniculate, variously contorted, often branched."

The characters in inverted commas are taken from the admirable *Hepaticæ and Anthocerotes of California* of Dr. Marshall A. Howe, who has examined a specimen of the species from Raddi's herbarium, the characters of the latter part being drawn from the specimen. The involucre is single, though Nees appears to think that they may be rarely geminate. In the few specimens which I have had the opportunity of examining they are solitary.

The tubers on the under side of the costa will alone distinguish this plant from any other of our known species. In these, glandular thickenings which might be mistaken for tubers may occur, but they are marginal. A young tuber developing at the apex of a costa appears as if marginal, but on examining older parts of the costa the tubers will be seen to be postical. The tubers seem to be comparatively rarely completely developed; in the English plant they are small, but usually evident. The channelled dichotomous costate segments, carinate beneath, the convexity being well seen in section, differ from that of our other species. On section also the absence of large air cavities will distinguish it from *A. punctatus* and *A. Stableri*. In fruit, the black echinate spores of these last species at once separate them. *A. lævis* has flat fronds with rounded segments, which are not carinate beneath.

The history of the discovery of this species in Britain is rather curious. When examining a collection of Hepaticæ which belonged to the late Alex. Croall, I found an unnamed *Anthoceros* in fruit, which appeared different from any of our known species. The locality was given, but it is sufficient to state that it is in the neighbourhood of Dawlish, Devonshire, the date being 7/1873, and the plant gathered by Croall. I sent a specimen to Herr Stephani, who thought it was a new species, but could not give a definite

opinion owing to the state of the fronds. As living plants or specimens preserved in alcohol were necessary, I wrote to Mrs. Tindall, who resides in the county, mentioning the circumstances, and asking if she could procure fresh specimens, and to forward them to Herr Stephani. Mrs. Tindall was not able at the time to visit the locality, but gave directions regarding it to Mr. Cuthbert Blakiston, who searched the place in April of this year, and sent her his gatherings. Among these Mrs. Tindall recognized that there were two different species, but at once sent them, both fresh and in alcohol, to Herr Stephani, who identified one as *Anthoceros dichotomus* Raddi; the other, which he found to be dioicous, being sterile and indeterminable in the meantime. Shortly afterwards Mrs. Tindall visited the locality herself, and found Raddi's species to be in such small quantity that she advised me not to give the locality too precisely. Croall's plant has no relation to *A. dichotomus*, his being an echinate black spored species allied to *A. punctatus*. We must wait for more light on this plant until Mrs. Tindall can gather it later in the season.

Anthoceros dichotomus was first found by Raddi near Florence, from which place I have specimens from Dr. E. Levier, and also from him from the island of Monte Cristo. It is a South European species, having been found in Italy, Portugal, and recently in the South of France, in Hérault, by Mons. A. Crozals. I am not aware if it has been found in other South European countries, or in North Africa, but it is quite a southern plant, and is one of the most interesting additions to the hepatic flora of the British Isles which has been made for many years. The Devonshire specimens which Mrs. Tindall has forwarded show immature capsules, also that the plant occurred on red sandstone.

Since the above was written, Mrs. Tindall has sent me the results of her examination, with drawings, of the specimens gathered by herself. She writes:—"I find the stalked antheridia are in groups of two or three, in pockets in the upper part of the frond. The archegonia occur in groups of three in cavities immediately below the antheridia. The sporogonia are sometimes single, but frequently in groups."

A NOTE ON HYBRIDS.

By Edward G. Gilbert, M.D.

The Rev. E. S. Marshall's note on *Primula elatior* and on hybrids (p. 314) calls for a few words of comment.

In the first place, he raises a phantom, and then protests against it; perhaps some obscurity in my notes (p. 281) may be responsible for it. The phantom is "that hybridity *alone* accounts for the great variety of Rubi that we possess." Surely it will require very cogent evidence to convince any careful observer of even the approximate truth of that. But, nevertheless, some years' very close and

continuous observation has produced in my mind a very strong *suspicion* that many of the rarer, or rather of the more thinly diffused Rubi, are hybrids; that these hybrids are more variable even than the true species; that they are by no means always sterile; and that their interminable variety is what has caused the impossibility found hitherto of referring every form to a definite place in a classification of the genus, or at least has been one great cause of this.

If these probabilities, or possibilities, are kept in mind, and should prove to be in actual accordance with facts, the truth of that will necessarily be discovered sooner than if they are lost sight of. That all forms are distinct species or varieties is equally theoretical with the idea that some are hybrids.

The evidence furnished by nature that many of the scarcer forms of British Rubi may be hybrids is strongly reinforced by the history of their study, and by the remarks about them and comparisons made between them by the most able and industrious students of them. The frequency with which these students are greatly puzzled by them is another little piece of contributory evidence. How often is a "variety" "just intermediate" between the type and some other species, or even one species between two others, perhaps belonging to different groups! As hybrids are known to occur not unfrequently, is it more theoretical to suspect these plants to be hybrids, if the supposed parents grow near by, than to suppose that they are varieties? In that wonderful storehouse of information as to the different forms existing, the Rev. W. Moyle Rogers' *Handbook of British Rubi*, we learn that different authorities sometimes disagree as to which of two species a particular form should be considered a variety of. This might well be, if it is a cross between the two, in some instances more resembling one of its parents, and in others the other. Take *R. opacus* Focke and *R. affinis* W. & N. var. *Briggsianus* Rogers. What light would be shed on their puzzling relations to one another and to *R. nitidus* W. & N. and *R. affinis* W. & N., if it should appear that the first two are a varying hybrid between the last two!

Take, again, *R. dumetorum* var. *fasciculatus* P. J. M., sometimes thought to be a variety of *R. corylifolius* Sm. This seems in some instances to resemble one most, in others the other; but in all to differ very considerably from any other form of either. Is it not more rational to suspect it to be a hybrid between some other *Rubus* and *R. dumetorum* sometimes, sometimes between the other and *R. corylifolius*? (Might not "the other" be *R. foliosus* W. & N.?) These suggestions are forced upon my mind, although I believe the Rubi to be extraordinarily variable also—more so than is always realised.

By reference to Smith's *English Flora* it may be seen that some years ago "the history and true nature" of *Primula elatior* were rendered obscure by the hybrid *P. acaulis* × *veris*. In fact, the two things were confused, and some botanists, I suppose, thought they were both one species, others that they were both the hybrid. Mr. Marshall says, "the case of the . . . brambles is not parallel." How does he know? If hybrids occur among the brambles, as he

asserts, is it not at least possible that there may be some hybrids still unsuspected of being such, but taken to be a series of ill-defined varieties or species? That point can only be completely settled, I should think, by experimental crossing. The forms which I have thought there is good reason to suspect were hybrids have exhibited a parallelism with *P. elatior* × *veris* in being polymorphic, and in being very scarce in comparison with their supposed parents.

It is very important, in my opinion, to examine carefully *all* specimens that seem to be aberrant or different in any way from those one has previously met with. By so doing is learned what is more, and what is less, variable in each species; and also what effects may be expected from the occurrence of the plant in an unusual environment; and hence a more ready recognition of any other species under the same circumstances.

Mr. Marshall does not explain how the fact that "*most* brambles are probably bird-sown at first" accounts for the existence of so many species. Nor does he enlighten us on the more interesting question of how the *minority*—not to be found in the surrounding country—came into existence.

SHORT NOTES.

East Sussex Plants.—The Rev. E. N. Bloomfield has asked me to send a note on the following plants found in Sussex:—*Trifolium resupinatum* L. In a pasture at Ore, near the Hastings Cemetery; a stray, but in fair quantity; not recorded from Sussex.—*Potentilla argentea* L. Cliff End, Pett, near the Military Canal; new to the East Rother division.—*Pyrola rotundifolia* L. Growing luxuriantly on the north slope of the railway cutting at Icklesham, five miles south-west of Rye. It is scattered here and there along at least three hundred yards of the bank, which slopes sharply to the north, and has copsewood growing on the top, thus keeping off the sun. I did not see a plant (or scarcely one) where it was not thus shaded. There is an old record for Sussex: "In Charlton, Sussex; Martyn" (Bot. Guide, 607, 1805). This is in West Sussex, but has never been confirmed. *P. media* and *P. minor* both grow in the county.—*Lycopodium clavatum* L. Beauport Park, near Hastings. Not recorded for the East Rother district. For the second and third Mr. Bloomfield was indebted to the Rev. H. Graham.—Arthur Bennett.

Valeriana Dioscoridis Sibth. et Sm. in Corfu.—Of this interesting species, which is beautifully figured on tab. 33 of the *Flora Græca*, Smith says: "Hæc est vere Φου Dioscoridis, a nemine botanicorum recentiorum ante Sibthorp detecta, et cujus locum in officinis Europæis jampridem usurpavit *Valeriana officinalis* Linnæi." Sibthorp's plant was collected in Lycia. It is not recorded for Corfu in Halácsy's *Conspectus Floræ Græcæ*, although given for Cephalonia and Zante. I gathered it last March on the cliffs of the picturesque hill which is crowned by the Castle of

San Angelo and overlooks the beautifully situated monastery of Paleokastrizza.—G. Claridge Druce.

Asplenium germanicum and A. septentrionale in Cumberland.—It may be well to put on record the fact that these two rare ferns still exist in a recorded locality in the above county. The Rev. H. J. Riddelsdell and myself saw two tufts of the former and thirty-seven of the latter rarity in splendid condition, growing on slate rocks with nearly southern exposure, at an altitude of about 600 feet above sea level, in August last.—G. Claridge Druce.

Arabis verna R. Br. in Sicily.—This pretty crucifer, which is not recorded for Sicily in Tornabene's *Flora Sicula*, I found on Mount Etna, near Milo. It is recorded from the Calabrian coast. *A. longisiliqua* and *A. collina* were also observed there.—G. Claridge Druce.

BOOK-NOTES, NEWS, &c.

We have received the first part of a new serial, *The Living Plant* (Hutchinson & Co.), which "claims to be the most up-to-date and most carefully produced book on the subject in this or any other language." As to the former of these claims it is perhaps too early to speak; but there is ample material in the number before us to show that the latter cannot be maintained. For example, plate V., an unmistakable *Sarracenia*, is labelled "a species of *Cephalotus*"; *Desmodium gyrans* (plate 1) is said to come from "India, Ceylon, and *Malaga*"; the Snowberry (p. 21) is glossed *Chiococca racemosa*, although the figure leaves no doubt that *Symphoricarpus*, which usually bears the name of Snowberry, is meant. The woodcuts are coarse and by no means characteristic—*e.g.* what is called "Punch-and-Judy Orchid" (fig. 4) gives no idea of the appearance of the flower, and "the *Haastia* of New Zealand" (fig. 3) is equally unsatisfactory. The book, indeed, suffers like other modern productions from over-illustration; nothing is to be learnt from "the bald burnt moor" (p. 2), which looks as if it had dropped out of a poetry book. Mr. A. E. Knight, one of the editors and the chief illustrator, cannot be congratulated on his fancy sketches, which are weak and uncharacteristic; and the coloured plate of Ragwort, by Sir H. H. Johnston, suggests a not very satisfactory design for a wall-paper. Plate 3 has been removed from our copy, but was included in, at any rate, some of the copies placed on sale; it represents *Spiræa salicifolia*, but is lettered "Meadowsweet, *Spiræa Ulmaria*." This argues gross carelessness somewhere; and we are quite sure that Dr. Rendle, who is said to be responsible for having "thoroughly revised" the work "in proof," cannot have had the plates submitted to him. There is room for a book of this kind, but unless subsequent issues show considerable improvement, it cannot be said that Messrs. Hutchinson have carried out the lavish promises contained in their prospectuses.

Mr. W. Percival Westell's *Country Rambles* (H. J. Drane; 10*s.* 6*d.*) is equally remarkable for the beauty of its illustrations (from photographs by Mr. J. T. Newman) and for the inanity of its letterpress. Mr. F. G. Aflalo, in his preface, likens Mr. Westell's observations to those of Gilbert White; but had the historian of Selborne descended to such trivialities as fill these pages, his work would never have attained immortality. Nor is triviality Mr. Westell's only fault, as the following extracts will show: "Meadow Barley out. How comes this to be reckoned as a wild flower? Is it not a grass?" (p. 109). "The silver sheen on the willows by the gin-bright (!) water very noticeable" (p. 191). "Ash forging ahead (the Bullrush like flowers (!) are well worth observing)" (p. 128). "Our concluding note to-day is to the effect that, have (*sic*) caressed some horses to-day when traversing across some park land, we feel we cannot do better than write as in schoolboy's days:—'The Horse is a noble animal'" (p. 304). These extracts, taken literally at random, give some notion of the contents of the book. We should like to see an edition containing the pictures only, which have little or no connection with the letterpress.

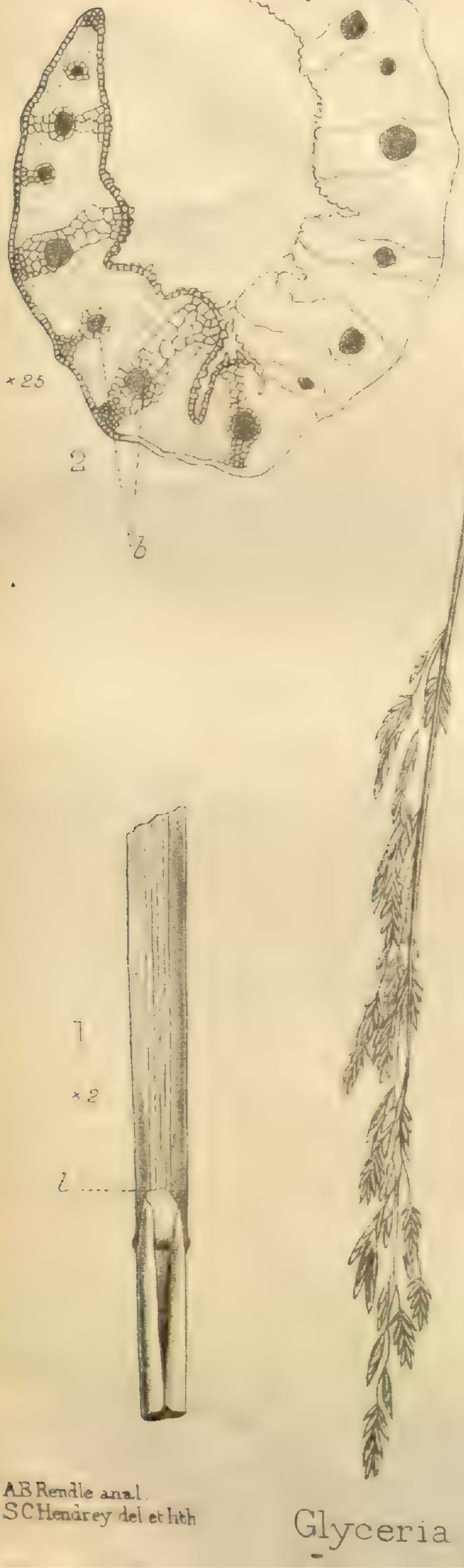
The first part of what should prove a useful *Flora of the Upper Gangetic Plain*, by Mr. J. F. Duthie, has been published by the Government Press, Calcutta. It is a handy square volume of over 400 pages, and contains the orders *Ranunculaceæ* to *Cornaceæ*, each species being fully described. A map, a glossary, and a synopsis of the natural orders add to the usefulness of the book, which costs 10 rupees (15 shillings).

We note with some surprise that "Kew Bulletin, ined." is still being quoted (Bot. Mag. t. 7900) as the place of publication of a new species. It is now just two years since a number (then six months overdue) of that eccentric little work appeared; we were then told that the publication would be resumed, and that the volume for 1900 was in preparation, but so far these promises remain unfulfilled. Meanwhile the practice of quoting from volumes which seem likely to remain "ined." is to be deprecated.

The Rev. W. R. Linton's *Flora of Derbyshire* will be published immediately. It forms an octavo volume of upwards of 400 pages, and is illustrated by two maps and a plate, Copies (price 10*s.* 6*d.* post free, to be raised to 12*s.* 6*d.* after publication) may be ordered from the author, Shirley Vicarage, Derby.

Under the title *L'Anatomie foliaire des Carex Suisses*, Henri Spinner, of Zurich University, presents, as an inaugural dissertation, a detailed account of the leaf-anatomy of the Swiss Carices. He comes to the conclusion that the present system of classification of *Carex*, established on floral characters, meets with only partial support on anatomical grounds. He does not agree with Duval-Jouve that a centimetre of a leaf of a sedge is sufficient for determination, but looks forward to the time when a knowledge of the details of the anatomy of all the vegetative organs will be available.

On and after October 15, all communications for the Editor should be addressed to 41 Boston Road, Brentford.



Glyceria festucæformis *Heyn*

A.B. Rendle ana.l.
S.C. Hendrey del. et lith.

West, Newman imp.

GLYCERIA FESTUCÆFORMIS IN IRELAND.

By A. B. Rendle, M.A., D.Sc.

(Plate 455.)

The claim of this plant to be considered a member of our British Island flora rests on its discovery by Mr. Lloyd Praeger in north-eastern Ireland, in July of the present year. Mr. Praeger has published a description of the locality and the habitat of the plant in the *Irish Naturalist* for October, from which we extract the following:—

"The Ards, anciently *Ard-Uladh*, 'the High Land of Ulster,' is the name given to the peninsula, some twenty miles in length by three to four miles in breadth, which lies between Strangford Lough and the Irish Sea, in County Down. A line drawn from Newtownards to Donaghadee will conveniently bound it on the north, while on all other sides it is fringed by sea. The area thus enclosed is about ninety-five square miles, or one-tenth of County Down. This is a low-lying, fertile, and highly cultivated district, its average elevation being not more than perhaps one hundred feet, the highest point three hundred and thirty-nine feet. Silurian slates, usually with a drift-covered and undulating surface, everywhere prevail, save for a strip of Bunter Sandstone along the head of Strangford Lough. The Ards forms the most easterly portion of Ireland, and its low coast-line, fringed with reefs extending far out to sea, is one to which vessels going up or down channel give a wide berth. . . . The outer coast of the Ards, which includes about thirty-five miles of shore-line, was examined with some care, as also the greater part (especially the lower portion) of the thirty miles or so of shore-line fronting Strangford Lough.

"The discovery of the plant is, in one sense, due to a farmer who, wishing to take a crop of hay off one of his meadows fronting the Lough, railed in a portion of the foreshore along with his field. This allowed the maritime vegetation to shoot up, while everywhere else along the shore it was closely cropped by cattle. While traversing this portion of the beach, which lies just north of the rocks at Marlfield Bay, my eye was at once caught with this tall upright *Glyceria*. It grew between two and three feet in height, with stems slightly arching at the top, and leaves a foot long, and was immediately distinguishable from *G. maritima*, which grew near, by the above features, and by its broader leaves and much stouter build. Having once noted its characters, it was easily traced along the shore, even though it was everywhere else eaten down, often to a stiff brush-like stump. The shore here is formed of boulder-clay, generally covered with a few inches of angular stones derived from the clay. Among the stones, below spring-tide level, are scattered clumps of *Glyceria maritima* and *Aster Tripolium*. *G. festucæformis* is associated with these, but generally grows a little farther down the beach, being the lowest plant of all. It grows

in small solitary clumps, and I traced it from the point before-mentioned northward along two miles of shore to Old Man's Head; and on a subsequent day, striking the sea just north of the mouth of the Blackstaff River (two miles north of the point last-mentioned), I saw it again. That the plant is indigenous there can be no shadow of doubt. In the whole of Strangford Lough there is no port where foreign vessels call. The sea traffic is confined to small local boats with cargoes of coal, bricks, and so on. Introduction by land is equally out of the question. The place is remote from railways and even from roads, and the plant grows amid a strictly indigenous flora."

The grass was sent to Professor Hackel, who wrote in reply:—"It belongs to *Atropis festucæformis* [Heynh. in] Reichenb., but the spikelets and flowers are as large as in *A. Foucaudii* Hack. ap. Foucaud in Bull. Soc. Bot. Rochell., 1893, 173, of which it has also the habit. But in *A. Foucaudii* the culm is thin-walled, the central cavity being very large; in *festucæformis* the culm is firm, thick-walled; the leaves are flat in *A. Foucaudii*, junciform [?] in *A. festucæformis*. We must name it *A. festucæformis* ad *A. Foucaudii* vergens."

I have seen no specimen of *A. Foucaudii*, nor is the Journal from which it is cited accessible to me; the species, moreover, finds no place in the Supplement to the Kew Index. Mr. Praeger says:—

"The *A. Foucaudii* referred to was described in 1893 from specimens collected in the department of Charente-Inférieure, W. France, but there appears some doubt as to whether it is now looked on as a good species or as a luxuriant extreme form of *G. maritima*. Rev. E. S. Marshall has gathered it in Kent (Flor. Kent, p. 405), and Miss Knowles collected a grass like it in Limerick this year." *

A comparison with the specimens in the National Herbarium suggests that the Irish plant is merely *Glyceria festucæformis* with rather larger spikelets than usual.

Glyceria festucæformis occurs on the north coast of the Mediterranean from southern France to south-west Russia. On its appearance in north-east Ireland, Mr. Praeger remarks:—

"We have grown accustomed to associate the occurrence of Mediterranean, or other southern species in Ireland, with southern or western ranges in this country (e. g. *Arbutus Unedo* and *Habenaria intacta*, which are widely spread Mediterranean plants, *Dabeocia polifolia*, *Saxifraga umbrosa*, &c.); and the occurrence of a Mediterranean species in the north-east of Ireland appears a startling anomaly. A little thought, however, tends to lessen one's astonishment. The Cantabrian group and other southern species of similar range in Ireland are as a rule upland plants, favouring a damp warm climate, and in many cases a peaty soil. They are a hygrophile-rigofuge group on the whole; and the hills of western Ireland supply just such a habitat as they like. *Habenaria intacta*, the only one with any xerophile tendencies, chooses the dry warm limestones. But a sea-shore plant like *Glyceria festucæformis*, assuming its occurrence

* See *Irish Naturalist*, October, 1903, p. 251.

anywhere in Ireland, one could not so confidently expect to find confined to the west. The western maritime flora is scanty compared to the eastern, and the habitat of this plant would protect it from frost in any part of Ireland. Furthermore, we find in the fauna a remarkable eastern range in Ireland of certain forms southern in Europe; this feature now at last finds a parallel among plants. The fine beetle, *Otiorrhynchus auropunctatus*, inhabiting the Pyrenees and Auvergne, and absent from Great Britain, ranges in Ireland along the *east* coast from Wicklow to Donegal. The snail, *Helix Pisana*, spread widely along the Mediterranean, reappears in Madeira and the Azores, S. Wales and Cornwall, and in Ireland along the *east* coast from Rush to Drogheda. The Dublin house-spider, *Tegenaria hibernica*, finds its nearest ally in a Pyrenean species. The famous 'Howth moth,' *Dianthæcia luteago* var. *Barrettii*, long believed to be confined to that peninsula, is now known to have elsewhere a characteristically south-western range in the British Isles, embracing Cornwall, Devon, Wales, Cork, and Waterford. On the other hand, we have Lusitanian animals which follow the south-western range of *Saxifraga Geum* and *Pinguicula grandiflora*, notably the famous Kerry slug, *Geomalacus maculosus*. So that, of those southern animals which reach Ireland, some range up the west coast, others up the east coast. It strikes one as not unnatural that the same thing should happen in the flora."

GLYCERIA FESTUCÆFORMIS Heynhold, apud Reichenb. Fl. Excurs. i. 45 (1830); Reichenb. Icon. Fl. Germ. i. 48, t. 152; Grenier & Godr. Fl. France, iii. 534; Nym. Consp. Fl. Eur. i. 831, and App. p. 339.

Atropis festucæformis Richter, Pl. Europ. i. 91 (1890).

Festuca Hostii Kunth, Rev. Gram. i. 129 (1830); Enum. i. 393.

Puccinellia festucæformis Parl. Fl. Ital. i. 368 (1850).

Poa arenaria var. *β* Trin. Mém. Acad. Imp. Sci. Pétersb. Sér. 6, i. 390 (1830).

Poa distans var. *major* Bert. Fl. Ital. i. 515 (1833), in part.

Poa festucæformis Host, Gram. Austr. iii. 12, t. 17 (1805).

? Poa mediterranea Chab. Act. Soc. Linn. Bord. xix. 45 (1853).

The following description has been drawn up and the plate prepared from specimens sent by Mr. Lloyd Praeger:—

Plants a little over two feet high. Stems cæspitose, erect, slightly geniculate at the upper nodes, surrounded at the base by the membranous leaf-sheaths, from inside which spring the young leaf-shoots; the elongated portion bears three nodes; the cylindrical internodes are, except the uppermost, closely enveloped for their whole length by the leaf-sheath. Leaf-sheath glabrous in the three upper leaves, ranging from 4 or 5 to 6 or 8 inches, the blades ranging from 8 to 2 or 3 inches, the uppermost sheath being three times as long as the blade, the top of which reaches to or beyond the base of the inflorescence. Ligule membranous, glabrous entire, with bluntly rounded apex, reaching 1½ lines in length. Blade very slightly thickened just above the insertion of the ligule, ascending rigidulous, convolute, apex weakly pungent, the sheltered upper

face ridged, ridges minutely hairy or papillose, otherwise the blade is glabrous. Panicle strict, linear, with a tendency to a secund arrangement, 6½ to 7½ inches long, reaching half an inch in width; branches erect, in a fascicle of 4 to 2 on one side the rachis at each node; the longest branch at each node naked in the lower part, one or two of the remainder very short and bearing only a single spikelet; rachis smooth, branches hispidulous. Spikelets rigidulous, sessile or shortly stalked, terete and narrowly linear-lanceolate in outline before flowering, becoming broader and suboblong when flowering; 5- to 8-flowered, rarely fewer, 4 to 7 lines long, rarely shorter. Barren glumes glabrous, green; membrano-herbaceous, with membranous transparent edges and apex; the lower lanceolate, subacute, nerveless, 1½ to 2 lines long; the upper elliptic, lanceolate, blunt, 3-nerved, 2 to 2½ lines long. Fertile glumes elliptical, blunt, inconspicuously 5-nerved, the lateral nerves shorter than the midrib; green, becoming purple above; membranous, the upper fifth thinner and often brownish; 2½ to 2 lines long; more or less puberulous in the lower part, especially on the nerves, otherwise glabrous. Pale scarcely shorter than the glume, nerves ciliolate. Lodicules rather large and broad, with an outwardly convex lower portion and a broad bi- to tridentate apex; about ½ line long. Ovary glabrous; filaments long and very slender; anthers 1 line long.

Hab. IRELAND. Shore of Strangford Lough, County Down. MEDITERRANEAN. South of France! Sardinia! Corsica! Corfu! North-east Italy! Dalmatia! Constantinople! Nauplia! Taurus!

DESCRIPTION OF PLATE 455.

Figure of plant, half natural size. 1. Portion of leaf, showing upper part of sheath, ligule (*l*) and lower part of blade, which has been unrolled to show the ridges on the upper surface, × 2. 2. A transverse section of the leaf-blade near its base, showing vascular bundles (*b*) and girders of supporting tissue connecting them with the lower, and, in the case of the stronger bundles, also with the upper epidermis. 3. A five-flowered spikelet, × 5. 4. A fertile glume, opened out and seen from the back, × 5. 5. Its pale, inside view, × 5. 6. Flower, the lodicules turned back to show the ovary, only one of the three stamens is shown, × 12. 7. A lodicule, viewed from the front, × 24.

SOME MOSSES AND HEPATICS OF SOUTH DONEGAL.

By H. W. LETT, M.A., M.R.I.A.

THE following is a list of some Mosses and Hepatics which were collected by me on the 11th and 12th June, 1902, on Slieve League, in the county of Donegal, a locality to which Mr. H. N. Dixon directed attention in the *Journal of Botany* for 1891, p. 360, as a promising ground for bryologists. This mountain, which at its summit attains an elevation of 1964 feet, is situated in South Donegal, nine miles west of Killybegs, which is the nearest railway station. It extends along Donegal Bay, where it is open to the Atlantic, and is so precipitous on the sea side as to be inaccessible from that

direction—the rocks go almost sheer down into deep water. Besides this long ridge there is another, which runs from it towards the east, and ends in the mass that overhangs the little village of Carrick, where there is a small but comfortable hotel. Along the north or land side of the long ridge there is very steep ground, with many sheer precipices, intersected by numerous gullies and rifts, where mosses and hepatics abound, and most of which can be partially explored. There is one portion of this ridge, which is 1240 feet above the level of the sea, that is known as the "One Man's Path," the track being so narrow as to admit of one person only passing along it at a time. Directly below this edge, due north-east on the landward side, but some 400 feet lower, lies embosomed amongst the heights and crags that tower above it a little mountain tarn called Loch Agh. The O.S. map shows the height of this loch to be 810 feet, and its distance, in a straight line from the sea, to be only one mile. All round this damp and sheltered spot mosses and hepatics grow in abundance, and it was difficult when evening came to tear oneself away from it. I do not suppose during my all too short visit to such a picturesque locality that all its mosses and hepatics were observed. My list contains respectively 115 mosses and 73 hepatics, the species in it with an asterisk prefixed is not known to me to be mentioned in any previous list of plants found in Ireland.

Sphagnum acutifolium Russ. & Warns. var. *flavorubellum* Warns. —*S. quinquefarium* Warns. var. *pallescens* Warns.—*S. quinquefarium* Warus. var. *roseum* Warns.—*S. subnitens* Russ. & Warns. var. *violascens* Warns.—*S. subnitens* Russ. & Warns. var. *versicolor* Warns. —*S. subnitens* Russ. & Warns. var. *virescens* Warns.—*S. cuspidatum* Russ. & Warns. var. *falcatum* Russ.—*S. cuspidatum* Russ. & Warns. var. *submersum* Schpr.—*S. recurvum* Russ. & Warns. var. *mucronatum* Warns.—*S. molluscum* Bruch.—*S. compactum* DC. var. *subsquarrosum* Warns.—*S. crassicladum* Warns.—*S. cymbifolium* Warns. var. *glaucescens* Warns.

Andreæa Rothii Web. & Mohr.—*A. petrophila* Ehrh.

Catharinea undulata Web. & Mohr.

Polytrichum aloides Hedw.—*P. piliferum* Schreb.—*P. commune* L.—*P. juniperinum* Willd.

Swartzia montana Lindb.

Ceratodon purpureum Brit.

Dichodontium flavescens Lindb.—*D. pellucidum* (L.).

Dicranella heteromalla Schimp.

Anisothecium squarrosum Lindb.

Blindia acuta B. & S.

Campylopus flexuosus Brid.—*C. pyriformis* Brid.—*C. fragilis* B. & S.—*C. atrovirens* De Not.—*C. paradoxus* Wils.—*C. Schwarzii* Schimp.

Dicranum scoparium Hedw.—*D. majus* Turn.—*D. fuscescens* Turn. —*D. scottianum* Turn.

Leucobryum glaucum Schimp.

Fissidens osmundioides Hedw.

Grimmia apocarpa Hedw.—*G. aciculare* C. M.—*G. fascicularis* C. M.—*G. hypnoides* Lindb.—*G. aquatica* (Brid.).

Glyphomitrium polyphyllum Mitt.
Hedwigia ciliata Ehrh.
Barbula rubella Mitt.—*B. rubella* Mitt. var. *ruberrima* Braithw.—*B. rigidula* Mitt.
Mollia litoralis Braithw.—*M. brachydontia* Lindb.—*M. tortuosa* Schrank.—*M. fragilis* Lindb.
Leersia extinctoria (L.).
Cinclodotus fontinaloides P. Beauv.
Webera sessilis Lindg.
Anœctangium Mougeotii Lindb.
Weisia phyllantha Lindb.—*W. ulophylla* Ehrh.
Orthotrichum affine Schrad.—*O. rupestre* Schleich.—*O. anomalum* Hedw.
Funaria attenuata Lindb.
Gymnocybe palustris Fries.
Bartramia ithyphylla Brid.
Pilonotis fontana Brid.—*P. fontana* Brid. var. *compacta* Schimp.
Breutelia chrysocoma Lindb.
Bryum filiforme Dicks.—*B. pallens* Sw.—*B. ventricosum* Dicks.—*B. capillare* L.—*B. alpinum* Huds.—*B. murale* Wils.
Mnium affine Bland.—*M. hornum* L.—*M. punctatum* L.—*M. rostratum* Schrad.—*M. undulatum* L.
Fontinalis antipyretica L.
Pterygophyllum lucens Brid.
Thamnium alopecurum B. & S.
Thuidium tamariscinum B. & S.
Climacium dendroides W. & M.
Orthothecium intricatum B. & S.
Isothecium myurum Brid.
Homalothecium sericeum B. & S.
Brachythecium rutabulum B. & S.—*B. rivulare* B. & S.—*B. plumosum* B. & S.
Eurhynchium myosuroides Schimp.—*E. rusciforme* Milde.—*E. rusciforme* Milde, var. *atlanticum* Brid.—*E. rusciforme* Milde, var. *prolixum* Brid.
Plagiothecium denticulatum B. & S.—*P. undulatum* B. & S.—*P. sylvaticum* B. & S.
Amblystegium filicinum De Not.
Hypnum revolvens Sw.—*H. commutatum* Hedw.—*H. falcatum* Brid.—*H. cupressiforme* L.—*H. molluscum* Hedw.—*H. eugyrium* Schimp.—*H. cuspidatum* L.—*H. Schreberi* Willd.—*H. exannulatum* Gümb.—*H. palustre* L.—*H. riparium* L.—*H. purum* L.
Hylocomium splendens B. & S.—*H. squarrosum* B. & S.—*H. triquetrum* B. & S.—*H. loreum* B. & S.
Preissia commutata Nees.
Conocephalus conicus (L.).
Metzgeria furcata (L.).—*M. furcata* (L.) var. *æruginosa* (Hook.).—*M. hamata* Lindb.—*M. conjugata* Lindb.
Aneura palmata (Hedw.).—*A. multifida* (L.).—*A. pinguis* (L.).
Pellia epiphylla (L.).
Lejeunia minutissima (Smith).—*L. ulicina* (Tayl.).—*L. hamatifolia*

(Hook.).—*L. serpyllifolia* (Dicks.).—*L. serpyllifolia* (Dicks.) var. *heterophylla* Carr.—*L. patens* Lindb.

Radula complanata (L.).—*R. Carringtoni* Jack.

Madotheca lævigata (Schrad.).

Frullania tamarisci (L.).

Pleurozia purpurea (Lightf.).

Diplophyllum albicans (L.).—*D. Dicksoni* (Hook.).

Scapania resupinata (L.).—*S. purpurascens* (Hook.).—*S. subalpina* Nees.—*S. speciosa* Nees.—*S. undulata* (L.).—*S. umbrosa* (Schrad.).—*S. irrigua* Nees.—*S. curta* (Mart.).—**S. rosacea* (Corda).

Marsupella emarginata (Ehrh.).—*M. sphacelata* (Gieseke).

Coleochila Taylori (Hook.).

Plagiochila spinulosa (Dicks.).

Lepidozia reptans (L.).—*L. setacea* (Web.).

Gymnocolea inflata (Huds.).

Lophocola bidentata (L.).—*L. lateralis* Dmrt.

Harpanthus scutatus (W. et M.).

Jungermania Floerkii W. et M. In my *Hepatics of the British Islands*, this locality is given, and also Co. Mayo, where I likewise collected it in 1901; it does not appear in any other list of Irish plants that I know of.—*J. Lyoni* Tayl.—*J. incisa* Schrad.—*J. barbata* Schreb.—*J. capitata* Hook.—*J. ventricosa* Dicks.—*J. exsecta* Schmid.—*J. bantriensis* Hook.—*J. orcadensis* Hook.

Aplozia sphærocarpa (Hook.).—*A. riparia* (Tayl.).

Alicularia scalaris (Schrad.).

Chiloscyphus polyanthos (L.).

Saccogyna viticulosa (L.).

Kantia trichomanis (L.).—*K. Sprengelii* (Mart.).

Cephalozia curvifolia (Dicks.).—*C. Francisci* (Hook.).—*C. bicuspidata* (L.).—*C. divaricata* (Sm.).—*C. Starkii* (Funck.).—*C. lunulæfolia* Dumort.—*C. pallida* Spruce.—*C. catenulata* (Hübn.).

Odontoschisma sphagni (Dicks.).—*O. denudata* (Nees).

Bazzania tricrenata (Wahl.).—*B. deflexa* (Nees).

Anthelia julacea (L.).

Herberta adunca (Dicks.).

Acolea crenulata (Carr).

NOTES ON RHINANTHUS.

By G. Claridge Druce, M.A., F.L.S.

The Rev. E. S. Marshall has placed British botanists under a sense of indebtedness by giving (pp. 291–300) an abstract of Dr. J. von Sterneck's *Monographie der Gattung Alectorolophus*, and for his own remarks upon the subject. I may perhaps be allowed to add a few localities, and to correct a slip or two which have crept into his interesting paper.

The following specimens in my herbarium have been determined by Dr. von Sterneck; the late Herr Freyn also indepen-

dently examined many of them, and his determinations agreed very closely with those of Dr. Sterneck.

I quite agree with Mr. Marshall in retaining the name *Rhinanthus* L. for the genus in preference to that of *Alectorolophus*, whether cited from Haller or Allioni.

The reason why Sterneck adopts *Alectorolophus Alectorolophus* in preference to *A. hirsutus* All. is because the earliest specific name given to it was *Rhinanthus Alectorolophus* by Pollock in 1777, and that name, as suggested by Mr. Marshall, is the one we should adopt. I have collected it in France, &c., but do not think it will be found in Britain other than as a casual plant.

Rhinanthus major Ehrh. Butr. v. 144 (1791). The Eddlesborough locality cited for Scotland is not north but south of the Tweed, being a parish close to the border of Beds and Bucks; but the locality is in the latter county (24). The plant grew in chalky cornfields and doubtless will be found to extend into Beds. The plant did not appear to me to be typical *major*, and is perhaps a colonist rather than native. I found it in 1900 on the marshy side of Llyn Coron, Anglesey (first record for 52), growing with a large form of *R. Crista-galli*. The Fort George locality cited by Mr. Marshall is in Easterness 96, not East Ross. I may add Arbroath, Forfar (A. Croall), and Richmond, Yorkshire (Herb. Oxon).

R. stenophyllus Schur. Enum. Pl. Transs. 512. *R. Crista-galli* L. var. *angustifolius* Koch, Syn. Fl. Germ. 544 (1837) and of my Fl. Berks. p. 384 (1897) where I said it was frequent in Scotland. The earliest British specimen which I know of was collected by me near the Boat of Garten, E. Inverness (96), in 1888, where I saw it growing the preceding year, *i.e.* three years before Messrs. Marshall and Hanbury gathered it at Tain, E. Ross (106) 1890. I have it also from Dover, Littlestone-on-Sea, Kent (15) 1902; near Arundel, W. Sussex (13), 1899; Newbury, Berks, (22), 1891; in Wheatley, Oxford (23); Winslow, &c., Bucks, 1902; Holy Island (68); Berwick-on-Tweed (81), 1901; Glen Spean, 1891; Fort William, col. 1903 (97); Forres, 1898 (95); Dalnaspidal, &c., Mid Perth, 1902 (88); Dalmally, Argyll (98); Polglass, Braemore, 1893; Inverbroom, &c., 1902 (105); Tain, F. J. Hanbury, 1900 (106) E. Ross; Golspie, E. Sutherland (107), 1902; Thurso, Caithness (109), 1902; Skye (104), 1903; Glengariff, Co. Cork (1890); Lough Owel (W. R. Linton sub nom. *R. Crista-galli* var. *fallax*) 1895; Westmeath, Glendalough, Co. Wicklow, 1901; Muckross, Killarney, Co. Kerry.

R. monticola Druce in Ann. Scot. Nat. Hist. 178 (1901). See also *Irish Naturalist*, June 1901, p. 128; Munlochy, in the Black Isle of Cromarty (106), July, 1880, and first as British at sea-level, Invercauld, S. Aberdeen (92), 1896, at 1800 feet alt.; Strath Vaich at 1000 feet; Ben Dearg, 1500 feet; E. Ross (106), 1902; Ben Dearg, W. Ross (105), 1902); Kingussie, Easterness (96), 1887; Glas Thulachan, E. Perth (89), 1899; Glen Nevis, Westerness (97), 1903.

R. Drummond-Hayi Druce in Ann. Scot. Nat. Hist. (1903), p. 171. Shell-sand, Tain, as sea-level, E. Ross (106), 1902; Ben

Dearg, Sgur Mhor, E. and W. Ross, 1902: Kenlochewe, on the Slioch, 1889, W. Ross (105), 1902; Clova, Forfar (92), 1889.

R. BOREALIS Druce in Ann. Scot. Nat. Hist. 178 (1901); Ben Laiogh, 2200 feet; Argyll (98), 1888; Ben Heasgarnich, 3000 feet; Ben Lawers, 2600 feet; Ben Laiogh, Lochan Larige, 2400 feet; Mid Perth (88), 1898; Ben Nevis, Westerness (97), 1903.

R. CRISTA-GALLI L. *R. minor* Ehrh. I see no reason why the Linnean name should be discarded, if the other segregates receive specific rank. The true plant determined by Sterneck I have from Wareham, Dorset, sub nom. *R. Crista-galli* var. *fallax* W. R. Linton, 1890; Harlingtou, Beds (30), sub nom. *R. Crista-galli* var. *major*, coll. J. Saunders ex Bot. Exc. Club, 1885; Great Grimsby, sub nom. *R. major* (1881), J. S. Rowe (53 or 54); Penzauce, Cornwall, 1897; Brixham, S. Devon, 1903; Portishead, Somerset, 1879; Marlborough, Wilts, 1888; Uxbridge, Middlesex, 1900; Binsey, 200 feet, Berks, 1893; Yarnton, 200 feet, Oxon, 1900; Oxford, 1879; Eddlesborough, Denham, Iver, Wonghton, Bucks (24) 1900; Salford, Beds (30); Fairford, E. Gloucesershire (33), 1884; Wootton-under-Edge, Gloster W. (34), 1901; Northampton, Nene Meadow (32), 1873; Glydyr Fawr, 1000 feet, LlynPeris side, Llauberis, Carnarvon, Pwlheli (49), 1900; Holyhead, Llyn Coron, Cors Bodeilio, near Llangefnair, Porth Dafarch, Anglesey (52), 1900; Strath Tay, Mid Perth (88); Ballater, S. Aberdeen 1800 feet (92), 1896; Mallaeg, Westerness (97), 1903; Dalmally, Argyll (98); Armadale, Skye (104), 1903; Polglass (105), 1893.

In the Report of the Botanical Exchange Club the name which I used, i.e. *R. stenophyllus* Schur, was said to be incorrect since Schur, it was stated, described it as *R. minor* var. *stenophyllus*. If one refers to his *Enumeratio plantarum Transsilvaniæ*, it will be found that Schur, while expressing a doubt as to the specific distinction of the plants, gives it specific rank (as quoted by the *Index Kewensis*), and it is duly indexed as *Rhinanthus stenophyllus*.

Many botanists would be content to place under *R. Crista-galli* L., as varieties, *stenophyllus*, *Drummond-Hayi*, *borealis*, and *monticola*; they appear to me to have their analogues in the micro-species of *Euphrasia*.

MR. KÄSSNER'S BRITISH EAST AFRICAN PLANTS.

III. ASCLEPIADACEÆ.*

By SPENCER MOORE, B.Sc., F.L.S.

Baseonema Gregorii Schlechter & Rendle. Kibwezi. No. 705.

Kanahia laniflora R. Br. Vena River, Manole River and Sani. Nos. 122, 324, 732.

No. 732 is a form with small flowers having corona lobes only 8 mm. long.

Schizoglossum masaicum N. E. Br. Schimba Mt. No. 197 (det. N. E. Br.).

Asclepias integra N. E. Br. Sultan Hamoud. No. 643.
A. denticulata Schlechter. Kikui. No. 1003.

Asclepias Kaessneri N. E. Br. sp. nov. Stems erect, branching, clothed with a white woolly pubescence on the terminal parts, becoming glabrous below. Leaves opposite, ascending-spreading; petiole $\frac{1}{8}$–$\frac{1}{4}$ in. long, woolly when young; blade $3\frac{1}{4}$–$6\frac{1}{4}$ in. long, $\frac{1}{4}$–$\frac{1}{2}$ in. broad, linear-lanceolate, gradually tapering to a very acute point, more or less acute at the base, flat or narrowly revolute along the margins, glabrous on both sides, or with a very minute scattered pubescence above, and thinly woolly along the midrib beneath. Umbels several to a stem, racemosely scattered along its upper portion, 4–6-flowered, ascending; peduncles and pedicels equal, $\frac{3}{4}$–$1\frac{1}{4}$ line long, woolly. Sepals $2\frac{1}{2}$–$3\frac{1}{4}$ lines long, 1 line broad at the base, thence gradually tapering to a very acute point, woolly, reflexed. Corolla lobed almost to the base, reflexed from the base, apparently whitish or yellowish; lobes $4\frac{1}{2}$–5 lin. long, $2\frac{1}{2}$–$2\frac{3}{4}$ lin. broad, ovate, obtusely pointed, shortly ciliate along one margin, otherwise quite glabrous. Coronal lobes arising $\frac{1}{2}$–$\frac{3}{4}$ lin. above the base of the staminal column, and reaching to the same level, $1\frac{3}{4}$–2 lin. long and broad, cuneately suborbicular in side view, much compressed, divided or complicate for only $\frac{1}{3}$ of the distance from the inner to the dorsal margin, with a falcate denticulate tooth from each apical angle recurving within a groove about $\frac{1}{3}$ lin. deep along the top of the lobe, which has a keel or crest extending along the bottom of it, and each of its sides marked by a ridge corresponding to the depth to which it is divided, while the base and inner margins are narrowly winged. Staminal column $2\frac{1}{4}$–$2\frac{1}{2}$ lin. long; anther-appendages remarkably short, $\frac{1}{4}$ lin. long, $\frac{3}{4}$ lin. broad, very obtusely rounded. Style depressed-truncate at the apex. Young follicles solitary, globose, very densely covered with long spreading intermingled hair-like pubescent processes greenish yellow in colour.

Hab. Kiu, no. 664.

Allied to *A. pubiseta* N. E. Br., but differing in its broader leaves, coronal lobes, and much more slender tortuous (not straight) processes on the fruit. I am indebted to Mr. N. E. Brown for the foregoing description.

A. macrantha Hochst. Moa (no. 33), and Schimba Mt. (without number).

A. reflexa Britten & Rendle. Mantaogo. No. 159.

Sarcostemma viminale R. Br. Simba and Bome River. Nos. 316, 727.

Dæmia extensa R. Br. Kili Makei. No. 612.

Cynanchum validum N. E. Br. Kibwezi River. No. 680.

Pentarrhinum insipidum E. Mey. Makindo. No. 564.

Tylophora stenoloba N. E. Br. Duruma River. No. 395 (det. N. E. Br.).

A NEW BRITISH HEPATIC.

By Rev. D. Lillie, B.D.

Jungermania Kaurini Limpr. Jahresb. Schles. Gesell. Vaterl. Cultur, 61, 204 (1884). *Jungermania Hornschuchiana paroica* Ekstrand, Bot. Notis. 36 (1879). *J. Müllerі* forma *paroica* Bernet, Cat. Hép. Sud-Ouest de la Suisse, &c. 68, Pl. 3 (1888). *J. Kaurini* Limpr. B. Kaalaas, Levermosernes udbredelse i Norge, p. 362 (1893). *Lophozia Kaurini* (Limpr.) Steph. Bull. de l'Herb. Boissier, ii. 1, 1147 (1901). *Lophozia Kaurini* (Limpr.) Evans, Yukon Hepaticæ, p. 20 (1903).

"*Paroica* 2–4 cm. longa et cum foliis 3 mm. lata, viridis—luteolo-viridis, acriter aromatico-odora, cæspites sat latos et laxos formans. *Caulis* laxus, erectus vel humifusus, postice ubique dense longeque hyalino-radicellosus, vulgo simplex, innovationibus 1–2 et ramis nonnullis tenuibus laxe foliatis ex axillis foliorum latere postico. *Folia* laxa, undulato-flexuosa, valde oblique inserta, horizontaliter patentia, antice paullum decurrentia, rotundato-quadrata, ad $\frac{1}{5}$–$\frac{1}{4}$ usque biloba, lobis pro more acutis, interdum obtusatis vel rotundatis, postico vulgo majore sinu lato, obtuso. *Cellulæ* rotundato-hexagonæ, basilares ovales, marginales minores, omnes valde collenchymaticæ, parum chlorophylliferæ, in foliis vetustioribus sæpe inanes, cuticula grosse striolato-verruculosa. *Amphigastria* pro magnitudine plantæ parva, subulata—lanceolata, integra, rarius ad $\frac{1}{2}$ inæqualiter bifida.

Bracteæ masculæ foliis majores, 4–6-jugæ (rarius pluri-jugæ), transverse affixæ, dimidio superiore reflexæ, ad basin saccatæ, margine antico sæpe lobulum rotundatum-obtusum inflexum gerente, antheridia 1–2 in axilla, globosa—ovalia, stipite brevi a cellulis 6–7 biseriatis, nuda vel paraphysibus filiformibus—lanceolatis; bracteæ superiores sæpe haud saccatæ antheridia inevoluta includentes. *Bracteæ perichætii* foliis æquemagnæ, vulgo obovatæ-obovales, e basi adpressa patentes, reflexæ apice rotundatæ, undulato-truncatæ—undulato-repandæ, interdum tamen etiam bilobæ, sinu gibboso. *Bracteola* auguste lanceolata ad basin lateribus ambabis dente longa subulata munita. *Perianthium* terminale cylindricum—cylindrico-clavatum, junius inferne e latere leniter compressum, postice vulgo obtuse bi-plicatum, ad maturitatem, capsulæ teres, superne in apicem longam tubulosam subito contractum, ore ciliato-dentato, tertia parte infima bi-, basi tri-striatum; cellulæ ovales–elongatæ. *Capsula* parva, ovalis; spori brunnei minute verruculosi; elateres duplo angustiores, bispiri, spiris purpureis."

(Kaalas, *l. c.*, after Limpricht).

Habitat.—Among mosses on damp shady rocks, Ousdale, Caithness; June 2nd, 1903. Found also in Norway, Switzerland, Siberia, North America (Yukon).

I gathered the *J. Kaurini* Limpr. at Ousdale, Caithness, about

a mile and a half from the Sutherlandshire boundary, in a small ravine, where, with mosses and other hepatics, it formed a kind of mat, hanging almost perpendicularly over the face of wet rocks. I did not see it anywhere but in the one place. The altitude would be about 500 feet, but with ground rising rapidly in the neighbourhood to a considerable elevation. The creeping barren stems, with their horizontal leaves with wide sinus and acute lobes, were very distinct. Also the abundant perianths on the fruiting stems were somewhat conspicuous by the hoary setulæ of the narrow tubular apex.

Under the microscope the Ousdale plants correspond very closely with Limpricht's description. The antheridia are present in the specimens I examined. The only paroicous hepatic of the *Mülleri* group with which it might be confounded appears to be *J. Ruthei* Limpr., which has not yet, so far as I know, been found in Britain. *J. Ruthei* appears to be usually a more robust plant, of a more reddish or purple appearance, with somewhat larger leaf-cells, and with the stipules much more divided. In the Ousdale specimens of *J. Kaurini* examined by me the stipules seem to be mostly entire, but Mr. Macvicar tells me he has found one bifid.

There is a very fine illustration of *J. Kaurini* in Bernet, Catalogue des Hép. du Sud-Ouest de la Suisse, pl. iii. Bernet shows the lobe at the base of the male bract as acute, whereas in the Ousdale plants it is rounded as in the description by Limpricht.

I may mention that in the same locality, at a somewhat greater elevation, I gathered *Harpanthus Flotowianus*.

For the identification of the *J. Kaurini*, and for the use of books and specimens illustrative of it, I am greatly indebted to the kindness of Mr. Macvicar.

TWO NEW SOUTH AFRICAN SCROPHULARIACEÆ.

By W. P. Hiern, F.R.S., F.L.S.

Sutera levis, sp. n. Suffruticosa glanduloso-puberula pallide viridis 4 dm. alta basi lignescens ut videtur perennis, caulibus ascendentibus sub-virgatis gracilentibus rigidis foliosis infra subteretibus striatisque super obtuse angulatis, foliis oppositis vel (surculis abbreviatis foliatis axillaribus) subfasciculatis linearibus apicem obtusum versus angustatis basim connatam versus sensim contractis paucidenticulatis vel integris firme herbaceis obscure nervosis 16–25 mm. longis 1–2·5 mm. latis, costâ mediâ infra prominulâ super anguste impressâ, floribus numerosis 4–5 mm. longis axillaribus subterminalibusque cymas terminales pyramidali-oblongas foliatas bracteatasque semipollicares formantibus, pedunculis gracilibus ebracteatis bibracteatisve brevibus vel ad 12 mm. longis, bracteis oppositis brevissimis vel ad 3 mm. longis, calyce 2–2·5 mm. longo valde glanduloso 5-fido campanulato, lobis lanceo-

latis acuminatis 1·5–1·7 mm. longis, corollâ infundibulariformi extra minute glandulosâ, tubo recto 3·5–4 mm. longo, limbo patente vix regulari 6 mm. diam., lobis ovalibus vel obovato-rotundis integris plus minus 2 mm. longis, staminibus 4 didynamis exsertis glabris, filamentis corollæ tubo medio insertis per paria inæqualibus pari breviore 2 mm. longo pari longiore 3 mm. longo, antheris subreniformibus confluentim uniloculatis omnibus perfectis, pistillo 5 mm. longo, ovario glabro ovali-oblongo compressiusculo ·8 mm. longo, stylo exserto minute glanduloso-puberulo rectiusculo tenui apicem bifidum stigmatosum versus paulum dilatato stamina leviter excedente.

Hab. Transvaal; Bezuidenhout Valley, Jan. 1903, *R. F. Rand*, n. 1156.

Phyllopodium rupestre, sp. n. Herba annua viscido-puberula debilis circiter 7 cm. alta basi præsertim ramosa, ramis pluribus tenuibus sub-teretibus 5–8 cm. longis decumbentibus vel ascendentibus basi foliatis apicem versus parce ramulosis, ramulis sæpius alternis, internodiis mediis comparate longis, foliis ellipticis ovatis vel late obovatis apice obtusis vel obtuse angustatis basi cuneatis petiolatis vel petiolantibus utrinque glanduloso-pilosis herbaceo-viridibus paucidentatis repandis vel sub-integris 3–8 mm. longis 1·5–4 mm. latis oppositis vel superioribus (floralibus) alternis, petiolis 1–4 mm. longis, floribus alternis 3·5 mm. longis brevissime pedicellatis 2–5-nis in cymulis brevibus numerosis terminalibus approximatis non capitatis, pedicellis uni-bracteatis, bractea foliacea elliptica petiolante pedicello vel calycis basi adhærente florem subæquante vel excedente, calyce vix bilabiato 2·5 mm. longo profunde 5-lobo extra viscido-pilosulo, segmentis lanceolatis acutis margine scarioso, corolla minute glandulosa marcescente vix bilabiata, tubo cylindrico 3 mm. longo ·5 mm. diam. apicem versus leviter ampliato atque ab uno latere aurantiaco, limbo patente 5-lobo 2·5–3 mm. diam., lobis ovatis vel oblongis pallidis ·8–1 mm. longis, staminibus 4 didynamis glabris vel subtiliter glandulosis, antheris parvis rotundatis confluentim uniloculatis pare altero sub-exserto altero subincluso, filamentis filiformibus brevibus, stylo filiformi subtiliter glanduloso subexserto, capsula ovoidea leviter compressa pallida glabra dure membranacea 2–2·5 mm. longa septicide dehiscente, valvis 2 apice bifidis placentas anguste oblongas 1·5 mm. longas liberantibus, seminibus numerosis minutis ovalibus glabris nigris.

Habitat in Africæ australis colonia *Transvaal* prope urbem *Johannesburg* a latere septentrionali *Bezuidenhout's Valley* inter rupes; legit mense Maio anni 1903 cl. *R. F. Rand* no. 1326.

THE MOSSES AND HEPATICS OF WORCESTERSHIRE.

By James E. Bagnall, A.L.S.

The following list of the Mosses and Hepatics of Worcestershire is a record of the work of Mr. E. Cleminshaw, M.A., of Birmingham, Mr. J. B. Duncan, of Bewdley, and myself, and gives the result of our work in all portions of the county. The records of the late Edwin Lees, of the Rev. J. H. Thompson, of Cradley, of Dr. G. H. Griffiths, of Worcester, and those of the Rev. A. Ley, M.A., have also been included so far as these were available, and are duly acknowledged.

My own work in Worcestershire began in 1868, but was suspended so that I might give my whole attention to other matters. In 1899, in conjunction with my indefatigable fellow-workers above named, to whom the record owes much of its fulness, this work was again resumed. I have also to thank Mr. R. E. Towndrow, of Malvern, for specimens collected in the neighbourhoods of Malvern and Worcester, some of which, such as *Tortula cuneifolia* and *T. angustata*, are rare.

The high state of cultivation that prevails throughout the county, together with the small area of heathland and marsh still existing, renders a rich moss and hepatic flora scarcely probable. The larger bogs—those of Feckenham and Moseley to wit—were drained during the last century, and their special mosses, such as *Sphagnum squarrosum* and *Hypnum scorpioides*, have disappeared. A noticeable feature is the rarity over wide areas of the tree-loving species, such as the Orthotrichums, *Zygodon*, *Ulota*, and *Cryphæa*, these being mainly confined to the west, the south, and south-east of the county. Still some unexpected mosses have been found—e.g. *Camptothecium nitens* and *Hypnum Sommerfelti* by Mr. Cleminshaw, the rare *Buxbaumia*, and *Octodiceros Julianum* (new to Britain), found by my very alert friend Mr. Duncan.

It is interesting to notice that, although the area of Worcestershire is smaller than that of Warwickshire, its moss and hepatic flora is more extensive. This I believe to be due to a difference in certain physical features. Wyre Forest still covers a considerable tract in the north-west of the county, and evident remains of its former greater extent are found in the Severn and Teme Valleys, a large portion of which is much broken up by rather deep little valleys, in many cases still wooded. The streams watering these valleys run over rocky banks, in many places marshy, and often with abundant broken and water-washed lias and other limestone rocks, and here is still found the remains of a former rich moss flora. The streams of Warwickshire are usually more sluggish, and their banks of alluvial mud yield only a few widely-distributed species. The hills of Worcestershire, though in many cases higher than those of Warwickshire, are too dry to nourish an extensive moss flora.

It may be mentioned that several of the records from Seckley and Upper Arley have already been given in my former notes on the moss flora of Staffordshire. Since that list was published, the parish of Arley including Seckley has, by the new survey, been included in Worcestershire. I have therefore repeated these records in the present list.

The total list here recorded is 283 species and 83 varieties of mosses, and 65 species and 2 varieties of hepatics.

Sphagnum acutifolium Russ. & Warnst. Lickey Hill; Jockey Brook, Pensax; Wyre Forest. — Var. *viride* Warnst. Foxholes, Habberley.—*S. quinquefarium* Warnst. Wyre Forest.—*S. submitens* Warnst. Rock Coppice, Bewdley; Wyre Forest. — Var. *griseum* Warnst. Wyre Forest. — *S. squarrosum* Pers. Feckenham, *Purt*; Malvern, *Lees*; Lickey Hill; Moseley Bog. — Var. *spectabile* Russ. & Warnst. Rock Coppice, Bewdley.—*S. cuspidatum* Russ. & Warnst. Lickey Hill.—*S. recurvum* Russ. & Warnst. Lickey Hill.—*S. molluscum* Bruch. Hartlebury Common. — *S. subsecundum* Limpr. Hartlebury Commou; Wyre Forest; Seckley Wood.—*S. inundatum* Warnst. Hartlebury Common; Wythall Heath; Wyre Forest.—*S. Gravetii* Warnst. Lickey Hill; Wythall Heath; Wyre Forest; Seckley Wood; Arley Wood.—*S. rufescens* Warnst. Lickey Hill; Wythall Heath; Seckley Wood; Arley Wood. — *S. crassicladum* Warnst. Coston Hacket; Lickey Hill; Pepper Wood, Bell End; Wyre Forest; Seckley Wood. — *S. cymbifolium* Warnst. Lickey Hill. — *S. papillosum* Lindb. Rock Coppice, Bewdley; Wyre Forest.

Tetraphis pellucida Hedw. Frequent, barren.

Catharinea undulata W. & N. Frequent. — Var. *Haussknechtii* Dixon. Chatley Green; Offmoor Wood; Seckley Wood; Northfield.

Polytrichum nanum Neck. Old Storridge Common; Bromsgrove; Lickey Hill; Barnt Green; Rhyd Covert, Bewdley; Wyre Forest; Cookley; Habberley Valley. — *β longisetum* Lindb. Old Storridge Common; Rhyd Covert, Bewdley; Barnt Green; Wyre Forest; Cookley.—*P. aloides* Hedw. Old Storridge Common; Lickey Hill; Rubery; Habberley Valley; Seckley Wood. — *P. urnigerum* L. Malvern Hills; Lickey Hill.—*P. piliferum* Schreb. Cowleigh Park, *Towndrow*; Church Lench; Kempsey Common; Shrawley Wood; Lickey Hill; Abberley Hill; Wyre Forest, &c. — *P. juniperinum* Willd. Old Storridge Common; Shrawley Wood; Pedmore Common; Lickey Hill; Abberley Valley; Wyre Forest.—*P. formosum* Hedw. Old Storridge Common! Cowleigh Park, *Towndrow*! Trench Wood; Hadley; Farm Wood, near Ombersley; Shrawley Wood; Randan Woods; Rubery; Habberley Valley; Wyre Forest; Seckley Wood.—*P. gracile* Dicks. Wyre Forest.—*P. commune* L. Old Storridge Common; Shrawley Wood; Lickey Hill; Abberley Hill; Seckley Wood; Wyre Forest; Acocks Green, &c.

Buxbaumia aphylla L. Very rare. Wyre Forest.

Archidium alternifolium Schimp. Malvern, *Lees*; Wyre Forest.

Pleuridium axillare Lindb. Pepper Wood, Bell End; Twylands

Wood, and Cocks Wood, Frankley; Iley; Truman's Heath; Stirchley Street; Moseley. — *P. subulatum* Rab. Old Storridge Common; North Wood, Bewdley; Wyre Forest; Seckley Wood; Frankley; Moseley; Acocks Green.—*P. alternifolium* Rab. Cocks Wood, Frankley, 1870; Offmoor Wood, Clent, 1870.

Ditrichum homomalum Hampe. Rare. Ravens Hill, near Alfrick. —*D. flexicaule* Hampe. Worcestershire Beacon, *Lees*; Cleeve Priors; Rous Lench; Raven's Hill old quarries; Eastham; old quarries, Suckley and Martley.

Ceratodon purpureus L. Very common. — *C. conicus* Lindb. Crome Park wall; *cft.* Wych and North Hill, Malvern; Highter Heath, near Kings Norton.

Cynodontium Bruntoni B. & S. Blackstone Rock, near Bewdley, *Rev. J. H. Thompson*! Bredon Hill; North Hill, Malvern; Wribbenhall; Seckley Wood; Blakeshall Common.

Dichodontium pellucidum Schimp. Pensax Dingle; Menith Wood, Pensax; Wyre Forest; Seckley Wood; Arley Wood; Rubery; Frankley, &c.

Dicranella heteromalla Schimp. Common. — *β stricta* Schimp. Wythall Heath; Weolley Quarries. — *γ interrupta* B. & S. Near Alvechurch; wood near Barnt Green; Wythall Heath. — *D. cerviculata* Schimp. Malvern, *Lees*; canal siding near Alvechurch.— *β pusilla* Schimp. Hartlebury Common. — *D. crispa* Schimp. Malvern, *Lees*.—*D. secunda* Lindb. Malvern Hill, *Dr. Griffiths*!— *D. rufescens* Schimp. Rare. Malvern Hill; Seckley Wood; Lickey Hill.—*D. varia* Schimp. Broadway Hill; Armscote; Clows Top; Eastham; Ediston; Ravens Hill; Old Storridge Common; Lickey Hill; Rubery; Offmoor; Pensax; Seckley Wood; Halesowen.—*D. Schreberi β elata* Schimp. Seckley Wood.

Dicranoweissia cirrhata Lindb. Frequent. — *D. crispula* Lindb. Malvern Hill, *Lees*.

Campylopus flexuosus Brid. Lickey Hill; Southstone Rock, near Bewdley; Shakenhurst; Habberley Valley. — *C. pyriformis* Brid. Canal side, Alvechurch; Lickey Hill; Bewdley; Wyre Forest; Seckley Wood; Blakeshall Common.

Dicranum Bonjeani De Not. Defford Common; Old Storridge Common; Lickey Hill; Beoley; Ribbesford; Habberley Valley, &c. — *β juniperifolium* Braithw. Kempsey Common; Warshill Wood. — *γ calcareum* Braithw. Limestone rocks, Old Storridge Common. — *rugifolium* Bosw. Malvern Hill; Wyre Forest. — *D. scoparium* Hedw. Malvern Hill; Old Storridge Hill; near Alvechurch; Randan Woods; Pitcher Oak Hill; Abberley Hill; Ribbesford Wood; Carpenters Hill Wood.—*β paludosum* Schimp. Kempsey Common; Blakeshall Common. — *γ orthophyllum* Brid. Kempsey Common; Malvern Hills; Seckley Wood; Arley Wood. A small form of type and var. *orthophyllum* on tree-roots in Seckley and Arley Woods. — *D. majus* Turn. Malvern Hills; Old Storridge Hill; Coston Hacket; Shrawley Wood; North Wood; Ribbesford Wood; Wyre Forest; Seckley Wood; Habberley Valley.—*D. fuscescens* Turn. Trench Wood, near Worcester.—*D. Scottianum* Turn. Malvern, *Lees*. — *D. strictum* Schleich. Rotting tree-trunks near

Hampton Lovett.—*D. flagellare* Hedw. Near Jackmans Hill, near Droitwich.—*D. montanum* Hedw. Trench Wood; Ockeridge Wood. near Grimley; Carpenters Hill Wood; Warshill Wood; Ribbesford Wood; Seckley Wood.

Leucobryum glaucum Schimp. Welland Common, *Lees*; Lickey Hill; Shrawley Wood; Rhyd Covert, near Bewdley; Ribbesford Wood; Wyre Forest.

Fissidens exilis Hedw. Barnt Green; Kings Norton; Grosty Hill; Offmoor Wood; Halesowen; Dick Brook, Pensax; Gladders Brook; North Wood; Upper Arley.—*F. viridulus* Wahl. Near Hewell Grange; near St. Kenelms; Halesowen; Eastham; Gladders Brook, Pensax; Clows Top, near Bewdley; Wyre Forest.—*β Lylei* Wils. Pensax Wood.—*F. pusillus* Wils. Near Stanford-on-Teme; Dick Brook, Pensax; Southstone Rock; Seckley Wood.—*β madidus* Spruce. Spout Farm, Eardiston.—*F. incurvus* Stark. Blockley; Wittington; Blackwell; Norton, near Worcester; Martley; Alvechurch; near Kings Norton; Offmoor.—*F. tamarindifolius* Wils. Ravens Hill, Alfrick; Ockeridge Wood, near Hallow; Ombersley; Wythall; St. Kenelms; Bewdley.—*F. bryoides* Hedw. Frequent.—*β inconstans* Bosw. By the River Severn, Upper Arley.—*F. crassipes* Wils. On boulders in the Stour, Halesowen, 1870; bridge over Severn, Bewdley; boulders in the Severn by Seckley Wood.—*F. adiantoides* Hedw. Defford; Wyre Forest; Seckley Wood; St. Kenelms.—*F. decipiens* De Not. Broadway limestone quarries; Bredon Hill; Cleeve Priors; Church Lench; Beoley; Gladders Brook; Ribbesford; Wyre Forest; Seckley Wood.—*F. taxifolius* Hedw. Frequent.

Conomitrium Julianum Mont. On submerged stones and wood in river Severn near Stourport; Bewdley; Upper Arley, and on into Shropshire. First record for Britain.

Grimmia apocarpa Hedw. Longdon Marsh; Wood Norton; Croome D'Abiton; Ravens Hill, Alfrick; Barnt Green; Offmoor; Seckley, &c.—*β rivularis* W. & N. Banks of river Severn near Upper Arley; Seckley.—*γ gracilis* W. & N. Leigh Sinton; Pensax; Severn banks, Upper Arley.—*G. pulvinata* Sw. Common.—*β obtusa* Hüb. Walls, Offmoor.—*G. trichophylla* Grev. Cowleigh Park, *Lees*; Worcestershire Beacon, Malvern; Old Storridge Common; Bewdley.—*G. subsquarrosa* Wils. North Hill, *Ley*; Worcestershire Beacon, Malvern.—*G. ovata* Schimp. Malvern, *Lees*.—*G. leucophæa* Grev. Malvern Hill?, *Thompson*.

Rhacomitrium aciculare Brid. Malvern Hill, *Purton, Midland Flora*, iii. 89; walls, New Brook, Frankley, in 1870.—*R. fasciculare* Brid. Walls, New Brook, Frankley.—*R. heterostichum* Brid. Cowleigh Park, *Ley*; Cleeve Hills; New Brook, Frankley; railway, Bewdley.—*β alopecurum* Hedw. Malvern Hills; New Brook, Frankley; railway-cutting, Bewdley.—*R. lanuginosum* Brid. Bredon Hills; Malvern Hill; New Brook, Frankley; railway-cutting, Bewdley.—*R. canescens* Brid. Malvern Hills!, *Purt.* iii. 85; New Brook, Frankley; Rubery; California; Hartlebury Common; Wyre Forest.

Ptychomitrium polyphyllum Fürn. Blockley; Bredon Hills

Malvern Hills; New Brook, Frankley; railway-cutting, Bewdley; Wyre Forest; near Seckley.

Hedwigia ciliata Ehrh. Malvern Hills! Cowleigh Park, *Ley*; Hollybush Hill; North Hill, Malvern.

Acaulon muticum C. M. Kings Norton, *Webb*! Righter Heath, near Kings Norton.

Phascum cuspidatum Schreb. Common in fallow fields and on waysides.—*P. curvicolle* Ehrh. Very rare. Mud-capped walls, Hanley Child.

Pottia truncatula Lindb. Frequent in fallow fields and on waysides.—*P. intermedia* Fürn. Blockley Fields, near Suckley; Martley; Righter Heath, near Kings Norton; Winnall Green; Selly Oak; Rubery; Grosty Hill; Halesowen; Bartley Green.—*P. Wilsoni* B. & S. Moseley, *Badger*; Crow's Hill, Alfrick.—*P. minutula* Fürn. Malvern Hill, *Thompson*; Newbould-on-Stour; Blockley; Preston-on-Stour; near Suckley; Trench Wood; Ombersley; Westwood Park, Droitwich; Arley Wood; Iley; Dudley Castle.—*P. Starkeana* C. M. Malvern, *Lees*.—*P. lanceolata* C. M. Sapey, *F. S. Lea*; Eastham; Overbury; Hanley Childs; Broadway; Defford Common; Littleton; Suckley; Old Storridge Common; Trench Wood; Martley; Grosty Hill.

Tortula pusilla Mitt. Malvern, *Lees*; Blockley; Paxford; Broadway; Newbould-on-Stour; North and South Littleton; Hanley Child.—*β incana* Braithw. Overbury; Bredon; Newbould-on-Stour; North and South Littleton.—*γ lamellata* Lindb. Paxford; Broadway; North Littleton.—*T. rigida* Schrad. Paxford; Newbould-on-Stour; Cleeve Prior; North Littleton.—*T. ambigua* Angstr. Blockley; Newbould-on-Stour; Church Lench; Littleton; Suckley; Knightwick, near Droitwich; Wyre Forest; Rubery.—*T. aloides* De Not. Blockley; Littleton; Ravens Hill; Crows Hill; Alfrick; Knightwick; Hanley Child; Martley; Pensax; Wyre Forest; Rubery; Frankley; Clent.—*T. cuneifolia* Roth. Pickersley, Malvern, *Towndrow*; Malvern Wells; Grosty Hill.—*T. marginata* Spr. Wittington; Shrawley; Bromsgrove; Coopers Hill; Barnt Green; Woodcote Hill; Seckley Wood; Northfield; Offmoor; Clent; Blakedown; Churchill.—*T. muralis* Hedw. Common.—*β rupestris* Wils. Broadway; Bredon Hill; Defford; Littleton; Hanley Child; Kings Norton, &c.—*γ æstiva* Brid. Bredon Hill; Wribbenhall; Seckley Wood; Bell End; Clent; Halesowen. —*incana* Schimp. Broadway; Alfrick; Clent.—*T. subulata* Hedw. Broadway; Dodford; Hanley Child; Lower Wych; Worcester Beacon; North Hill; Woodcote Green; Standon Bridge; Lyehead; Ribbesford; Rhyd Covert.—*T. angustata* Wils. Hedgebank, Pickersley, *Towndrow*!—*T. mutica* Lindb. Pickersley, *Towndrow*! Armscote; Cleeve Priors; Harvington; Peopleton; Pershore; Ombersley; Feckenham; Bewdley; Halesowen.—*T. lævipila* Schwaegr. Longdon Marsh; Alderminster; Harvington; Pershore, &c.—*T. intermedia* Berk. Great Cowleigh, *Ley*; Worcester, *Towndrow*! Broadway; Bredon; Alderminster; Alfrick; Wittington; Old Storridge Common; Standon Bridge.—*T. ruralis* Ehrh. Bredon; Defford; Hanley Child; Aston Magna; Alderminster;

Preston-on-Stour; Malvern Hills, &c.—*T. papillosa* Wils. Broadway; Longdon Marsh; Alderminster; near Tewkesbury; Cleeve Priors.

(To be concluded.)

BIOGRAPHICAL INDEX OF BRITISH AND IRISH BOTANISTS.

By James Britten, K.S.G., F.L.S., & G. S. Boulger, F.L.S., F.G.S.

Second Supplement (1898–1902).

(Continued from p. 346.)

Clifton, George (fl. 1853–1890): R.N. Of Fremantle, W. Australia. Sent Australian Algæ to Harvey, who dedicated to him vol. i. 'Phycologia Australia' as "an acute observer and successful collector of Algæ." Phyc. Austr. v. pref. tt. 249, 279. Algæ presented to Herb. Mus. Brit. *Cliftonæa* Harv. *Cliftonella* J. E. Gray = *Acetabularia*.

Clifton, William (fl. 1765): Attorney-General of Georgia in 1759; Chief Justice of West Florida. Sent Florida plants to J. Ellis, collected by negro servant in 1765. Phil. Trans. lx. 527. Linn. Corr. i. 438, 571. Journ. Bot. 1903, 87. *Cliftonia* Banks.

Colenso, Rev. William (1811–99): b. Penzance, 1811; d. Napier, N. Zealand, 10 Feb. 1899. F.L.S., 1865. F.R.S., 1886. To N. Zealand, 1833. Ordained 1844. Helped J. D. Hooker with Fl. N. Zealand. Sent over 5000 pl. to Kew (1840–94). 'Bot. of N. Island of N. Z.,' 1865. 'Ferns of N. Island.' 1845. Journ. Bot. 1844, 3. Jacks. 403. Pritz. 65. R.S.C. ii. 13; vii. 415; ix. 550. Proc. Linn. Soc. 1898–9, 51. 'Nat. Science,' March, 1899. *Colensoa* Hook. f. = *Pratia*.

Collett, Sir Henry (1836–1901): 6 March, 1836; d. London, 21 Dec. 1901. Col. Bengal Army. K.C.B., 1893. F.L.S., 1879. Took up botany in 1877. 'Flora Simlensis,' 1902. Collected in the Shan States, Kuram Valley. Herb. at Kew. Proc. Linn. Soc. 1901–2, 28. Preface to 'Fl. Simlensis.' Journ. Bot. 1902, 73. Proc. Linn. Soc. 1901–2, 28. *Neocolletia* Hemsl.

Comber, Thomas (1837–1902): b. Pernambuco, Brazil, 14 Nov. 1837; d. Blackpool, Lanc., 24 Jan. 1902. F.L.S., 1878. Diatomist. 'Geogr. statistics of European Flora,' Journ. Bot. 1877. Diatoms in Herb. Mus. Brit. Phanerogams at Victoria University, Liverpool. Jacks. 227, 230. Journ. Bot. 1902, 386, w. portr. Proc. Linn. Soc. 1901–2, 30.

Courtauld, Sydney (1840–99): b. Bocking Place, Braintree, Essex, 10 March, 1840; d. same place, 20 Oct. 1899. 'Ferns of Brit. Isles described and photographed,' 1877.

Cowburn, Thomas Brett (1839–92): b. Sydenham, Kent, 16 Nov. 1839; d. Dermel Hill, 1892. Major 52nd Light Infantry. Pteri-

dologist. Found *Scolopendrium vulgare Cowburni*. Lowe, 'Fern-growing,' 180–1, w. portr.

Crichton, Rev. Arthur (fl. 1818): 'The Festival of Flora: a Poem: with botanical notes,' 1818.

Curdie, Daniel (fl. 1855): M.D. Of Tandarook, near Geelong. "An early observer of the algæ of Australia." Sent Australian Algæ to Harvey. Ann. Mag. Nat. Hist. 2, xv. 333. *Curdiæa* Harv.

Curtis, Charles M. (fl. 1830): Botanical artist. Drew tt. 15–17 under R. Brown's direction for Wall. Pl. Asiat.; see vol. i. p. 15.

Davidson, Rev. George (d. 1901): d. Aberdeen, 16 Sept. 1901. M.A. LL.D., Aberdeen, 1886. Minister of Logie-Coldstone, Aberdeensh. Diatomist. R.S.C. ix. 647. Gard. Chron. 1901, ii. 233.

Dawson, Sir John William (1820–99): b. Picton, Nova Scotia, 13 Oct. 1820; d. Montreal, 19 Nov. 1899. Prof. Geol. and Principal McGill Coll., Montreal, 1855. F.R.S., 1862. M.A., Edin., 1842. LL.D., 1884. Knighted, 1884. 'Alpine and Arctic Pl.,' 1862. 'Geological Hist. of Pl.,' 1892. Jacks. 537. R.S.C. xii. 187. Dict. Nat. Biog. Supp. ii. 120. Portr. in Redpath Museum, Montreal.

Dickinson, Francis (1816–1901): b. Coalbrookdale, Salop, 4 Jan. 1816; d. Crookham Hill, Edenbridge, Surrey, 24 Aug. 1901. Contrib. to Leighton's 'Fl. of Shropsh.,' 1841. Journ. Bot. 1901, 434.

Dowden, Richard (1794–1861): b, Bandon, Co. Cork, 12 April, 1794; d. Cork, 5 Aug. 1861. 'Walks after Wild Flowers,' 1852. Pritz. 90. Jacks. 247.

Dowker, George (1828–99): b. Margate, Kent, 2 April, 1828; d. Ramsgate, Kent, 22 Sept. 1899. 'Falcaria Rivini,' Journ. Bot. 1889, p. 272. Investigated Thanet plants: see Pittock's 'Flora of Thanet,' p. 3. Journ. Bot. 1899, 406. *Osmundites Dowkeri* Carruthers.

Du Port, Rev. James Mourant (1832–99): b. St. Peter Port, Guernsey, 14 April 1832; d. Denver Rectory, Norfolk, 21 Feb. 1899. B.A., Camb., 1855. Mycologist. Contrib. to Trans. of Woolhope Club and Norfolk and Norwich N. H. Soc. Gard. Chron. 1899, i. 141. Journ. Bot. 1899, 192. Trans. Brit. Mycol. Soc. 1897–8, 82 (portr.). *Russula Du Porti* Phillips.

Eales, — (fl. 1696): M.D. Of Welwyn, Herts. Sent plants to Ray, Syn. ii. First recorded *Mentha piperita*. Pryor Fl. Herts, xxxix.

Edwards, John (fl. 1819–25): Surgeon of the 'Hecla,' Parry Expeditions, 1819–20, 21–23. Had an "extensive and well-preserved herbarium." R. Brown, Appx. Parry's Voyage, p. cclxviii. Hooker, Appx. Parry's 2nd Voyage, 382. *Eutrema Edwardsii* Br.

Edwards, Thomas (fl. 1800–45): F.L.S., 1811. Contrib. article on Botany (1845) and others on plants to 'Encyclopædia Metropolitana.'

Evans, Thomas (fl. 1792–1810): Of the India House and Stepney.

Had a garden. Sent collector to Pulo Penang. "Devoted almost his whole income to the acquirement of new and rare plants [from China, &c.], which he generously distributed among other collectors." Bot. Mag. 1783. Bretschneider, Bot. Discov. in China, 217. *Evansia* Salisb. = *Iris*.

Farrer, Thomas Henry, 1st Baron (1819–99): b. London, 24 June, 1819; d. Abinger Hall, Surrey, 11 Oct. 1899. B.A., Oxon, 1841. F.L.S., 1869. Baronet, 1883. Baron, 1893. 'Fertilization of Papilionaceous Flowers' in 'Nature,' 1872 Proc. Linn. Soc. 1899–1900, 65. Dict. Nat. Biog. Supp. ii. 201. Portr. by Holl in possession of family.

Fereday, Rev. John (A.M.) and **Mrs.** (fl. 1855): Of Georgetown, Tasmania. Helped Harvey in collecting seaweeds, Phyc. Austral. i. t. 47, iii. 173. Algæ in Brit. Mus. acquired from Paris Exhibition, 1855. *Cladophora Feredayi* Harv. *Dasya Feredayæ* Harv.

Fisher, George (1794–1873): b. Sunbury, Middx., 31 July, 1794; d. 14 May, 1873. B.A., Camb., 1821. M.A., 1825. F.R.S., 1825. Astronomer. Collected plants on Parry's first voyage, 1819–20; Appx. to Voyage, p. cclxi. Dict. Nat. Biog. xix. 56.

Flower, Thomas Bruges (1817–99): b. 1817; d. Bath, 7 Oct. 1899. F.R.C.S. F.L.S., 1839. Reading plants in 'Environs of Reading,' 1845. 'Flora Thanetensis,' 1847. Contrib. to Phytol., Journ. Bot., Top. Bot., &c. 'Flora of Wilts' in Wilts Archæolog. Mag. 1857–74. Proc. Linn. Soc. 1899–1900, 66. Journ. Bot. 1900, p. 32. Pritz. 109. Jacks. 546. R.S.C. ii. 646; vii. 679; ix. 887.

Freeman, Strickland (fl. 1797–1809): Edited 'Select Specimens of Brit. Plants.'—See Strickland, Charlotte (his sister-in law).

Gardner, Hon. Edward (fl. 1817): Resident at Court of Katmandoo. Collected in Nepaul, 1817. Wall. Pl. Asiat. i. 33, &c.; ii. 31.

Geldart, Herbert Decimus (1831–1902): b. Felthorpe Hall. nr. Norwich, 11 July, 1831; d. Thorpe Hamlet, Norwich, 21 Sept. 1902. Contrib. on local and arctic pl. to Trans. Norfolk and Norwich Nat. Soc. Norfolk Bot. in 'Victoria History,' 1901. Herb. acquired by Horniman Museum. Journ. Bot. 1902, 431.

George, Edward (d. 1900): d. Forest Hill, Surrey, 10 Oct. 1900. Bryologist and algologist. Herbarium acquired by Horniman Museum. Journ. Bot. 1900, 455. *Rhodophysema Georgii* Batters.

Gerard, — (d. 1840): Gardener at Versailles; came to England at outbreak of French Revolution. Collected herbs for Apothecaries' Hall, &c. Lived in Marylebone; knew London plants well. Had a herbarium. Said to have discovered *Wolffia arrhiza* at Putney *c.* 1816; see Journ. Bot. 1866, 263.

Gill, C. Haughton (1841–1894): b. Wells, 12 June, 1841; d. 21 Feb. 1894. F.R.M.S. Prof. Chemistry, London Univ. Diatomist. Cultivated diatoms. Papers in Journ. R. Microscop. Soc. 1889–91. R.S.C. vii. 774. 'Diatomiste,' ii. 125.

Gray, Peter (1818–99): b. Dumfries, 18 Oct. 1818; d. Lochar-

briggs, Dumfries, 3 June, 1899; bur. Troqueer Churchyard. Contrib. to Phytologist and Top. Bot. 'Lichens' and 'Mosses,' 1886. Journ. Bot. 1899, 336.

Gray, Samuel Octavius (1828–1902): b. Bloomsbury, London, 14 Oct. 1828; d. Rudgwick, Sussex, 15 May, 1902. Nephew of J. E. Gray. 'British Seaweeds,' 1867. Herbarium of algæ at the Owens College, Manchester.

Greenway, — (fl. 1773–1775): "Med. Dris. in Virginia . . . Misit ille ab a. 1773–1775 plantas Virginicas siccatas, vivas a se collectas, ad 400, eo fine ad me, ut novam Floram Virginicam juncto labore concinnaremus, sed bello inter Anglos & colonias orto, conatus omnino profligatus est, ita ut nesciam num vivus adhuc supersit nec-ne?" Giseke, Prælectiones, 226. *Greenwaya* Gis. = *Amomum*.

Greg, John (fl. 1766–86): Collected in West Indies, 1766–1777. Sent plants to Lord Hillsborough, who sent them to Banks. Linn. Corresp. i. 189. *Greggia* Soland. = *Eugenia*.

Grey, Eliza Lucy, *née* Spencer (d. 1898): d. London, Sept. 1898; m. 1839 Captain, afterwards Sir George Grey (1812–98). Collected in Adelaide 1841–5. Sent plants (now in Herb. Brit. Mus.) to Brown. Letters in Brown's Correspondence.

Griffiths, Rev. Evan (1794–1873): Of Swansea. 'Family Herbal' (in Welsh, 'Y Llysieulyfr Teuluaidd) (w. Rev. Rees Price), 1849. Journ. Bot. 1898, 18.

Gulson, Mrs. (fl. 1855): Of Exmouth. Collected Devonshire algæ. Ann. Mag. Nat. Hist. Ser. 2, xv. 334. *Gulsonia* Harv.

Gunn, Rev. George (1861–1900): b. Edinburgh, 1861; d. Peebles, 12 Jan. 1900. M.A., Edin. Minister of Stichill, near Kelso, from 1878. "A good field botanist." Cultivated alpines. Purchased Andrew Brotherston's Herbarium. Secretary Berwickshire Nat. Club. Trans. Bot. Soc. Ed. xxi. 277.

Guthrie, Francis (1831–99): b. London, 1831; d. Claremount, Cape Town, Oct. 1899. B.A., London, 1850. LL.B., 1852. Prof. Math. S. African Coll., 1876–98. Preparing *Ericaceæ* for 'Flora Capensis' at time of his death. 'Evolution illustrated by Distrib. of Plants,' Trans. Phil. Soc. S. Africa, v. 274. Kew Bull. 1899, 221. Journ. Bot. 1899, 528. R.S.C. vii. 876; x. 96; xii. 300. *Erica Guthriei* Bolus.

Haast, Sir Johann Franz Julius (1824–87): b. Bonn, 1 May, 1824; d. Christchurch, N. Zealand, 16 Aug. 1887. F.R.S., 1867. F.L.S., 1864. Knighted, 1885. To N. Zealand, 1858. Government Geologist at Canterbury, N. Z. Made large collections N. Z. plants. Pref. Handb. N. Z. Flora, 12*. R.S.C. vii. 880; x. 103. Dict. Nat. Biog. xxiii. 412. *Haastia* Hook. f.

Hagger, John (d. 1895): d. 1 Mar. 1895. F.L.S., 1891. Master in Repton School. Herbarium at Univ. Coll., Nottingham. Contrib. to 'Flora of Repton.'

Hardy, James (1815–98): Of Old Cambus, East Lothian. Had a fine bot. library. 'Plant Lore,' 1864. Lichenologist, Bryologist, Entomologist. Wrote many papers on folk-lore of plants.

Jacks. 246. R.S.C. iii. 176; vii. 907; x. 141. Gard. Chron. 1900, ii. 72. Hist. Berw. Nat. Club, xvi. 341.

Hart, J. (fl. 1825): Botanical artist. Illustrated 'Bot. Register' and Watson's 'Dendrologia.'

Heaton, John Deakin (d. 1880): d. Claremont, Leeds, 1880. M.D., London, 1843. Dean of Leeds Medical School. Herbarium collected round Leeds, 1835-65, in possession of F. Arnold Lees, Esq. Memoir by T. Wemyss Reid, 1883, w. portr. 'Naturalist,' 1900, 51.

Henry, Caroline (d. 1894): Wife of Dr. A. Henry. Collected in China, Japan, and Colorado, 1891–94. Plants at Kew. Ic. Plant. 2726. *Carolinella Henryi* Hemsl.

Hobkirk, Charles Codrington Pressick (1837–1902): b. Huddersfield, Yorks, 13 Jan. 1837; d. Ilkley, Yorks, 29 July, 1902; bur. Huddersfield Cemetery. F.L.S., 1878. Bryologist. 'Synopsis of Brit. Mosses,' 1873; ed. ii. 1884. 'London Cat. of Brit. Mosses,' 1877 (w. H. Boswell). 'Sur les formes du *Capsella*,' Bull. Soc. Roy. Bot. Belg. 1879. Contrib. to Phytol., Journ. Bot., &c. Jacks. 559. Journ. Bot. 1902, 431. 'Naturalist,' 1903, 105 (portr.).

Hodgson, William (1824–1901): b. Raughton Head Hill, Dalston, Cumberland, 7 April, 1824; d. Workington, Cumberland, 27 March, 1901. Schoolmaster. A.L.S., 1884. 'Flora of Cumberland,' 1898. Proc. Linn. Soc. 1900–1, 44; 'Naturalist,' 1901, 261 (portr.). Journ. Bot. 1901, 191.

Howie, Charles (1811–99): b. 1811; d. St. Andrews, 22 July, 1899. Associate, Bot. Soc. Edinb. Nurseryman and seedsman. Of St. Andrews. Bryologist. Correspondent of W. Wilson, 1845–70. Contrib. to 'Phytologist,' 1857–9, and Trans. Bot. Soc. Edinb. 1868-70. 'Mosses of Fifeshire' (dried specimens). 'Moss Flora of Fife and Kinross,' 1889. R.S.C. iii. 451; vii. 1024; x. 280. *Carduus Carolorum* Howie and Jenner.

Hunter, Robert (d. before 1847): M.D. Of Margate. 'Descript. Isle of Thanet,' 1802 (list of plants, pp. 97–107). MS. Flora of Thanet. Flower, 'Fl. Thanetensis,' pref. vi.

Hussey, Benjamin (fl. 1767): Collected in Falkland Islands in 1767. Salisb. Prodr. 89, 90.

Jeannerett, — (fl. 1847): Of Tasmania. Sent algæ from Port Arthur to Harvey. Harv. 'Nereis Australis,' 20. *Jeannerettia* Hook. fil. & Harv.

Jenman, George Samuel (1845–1902): b. Plymouth, 24 Aug. (? 13 Oct.) 1845; d. Georgetown, Brit. Guiana, 28 Feb. 1902; bur. St. Sidwell's, Georgetown. Kew gardener, 1871–73. Curator, Castleton, Jamaica, 1873. Superintendent, Georgetown, Brit. Guiana, 1879. Pteridologist. 'Hand-list of Ferns of Jamaica,' 1881. Jacks. 509. Proc. Linn. Soc. 1901–2, 37. Journ. Kew Guild, 1902, 92. R.S.C. xii. 367. Journ. Bot. 1902, 237.

Jones, Arthur Coppen (1866–1901): b. London, 1866; d. Davos Platz, 8 March, 1901. Bacteriologist. Pupil of Huxley. Trans-

lated Fischer's 'Structure and Fuuction of Bacteria,' 1900. Journ. Bot. 1901, 191.

Jones, Arthur Mowbray (1826-89): b. Ringwood, Hants, 8 Jan. 1826; d. Clifton, Bristol, 28 Feb. 1889; bur. Redland Green, Bristol. Entered army 1849. Colonel, West York Militia. Lieut.-Col. 1st Volunt. Batt. Gloucester, 1881. Pteridologist. 'Impressions of Varieties of British Ferns,' 1876-9. Ferns at Clifton Zoolog. Gardens. E. J. Lowe, 'Fern-growing' (portr.). Kew Libr. Cat. 312.

Jones, David T. (fl. 1817): Of Llanllyfni. 'Herbal, neu Lysieu-Lyfr,' 1817, ed. ii. 1818, ed. iii. 1862 (?). Journ. Bot. 1898, 18.

Kennedy, John (1759–1842): b. Vineyard, Hammersmith, 30 Oct. 1759; d. Eltham, Kent, 18 Feb. 1842; bur. Eltham. Son and successor of Lewis Kennedy. Author of the 'Prodromus of pl. in Southampton Bot. Gard.,' issued by his brother-in-law, W. B. Page, in 1817.

Kirby, Rev. William (1759–1850): b. Witnesham, Suffolk, 19 Sept. 1759; d. Barham, Suffolk, 4 July, 1850. B.A., Camb., 1781. M.A., Camb., 1815. F.R.S., 1818. F.L.S., 1796. Rector of Barham, Suffolk, 1796. Entomologist. Made collection of plants of Barham. 'Life,' by Rev. John Freeman, 1852, w. bibliog. and portr. Dict. Nat. Biogr. xxxi. 199. Proc. Linn. Soc. 1888–9, 37. Water-colour portr. at Linn. Soc.

Kirk, Thomas (1828–97): b. Coventry, 18 Jan. 1828; d. Plimmerton, Wellington, N. Zealand, 8 March, 1898. F.L.S., 1871. To N. Zealand, 1863. Curator of N. Z. Institute. Lecturer on Nat. Sci., Wellington College, N. Z. Papers in 'Phytologist,' 1847–1860; Trans. N. Z. Institute, 1868–1897. 'Forest Flora N. Zealand,' 1889. 'Students' Fl. N. Zealand' (posthumous), 1899. R.S.C. iii. 662; viii. 79; x. 403; xii. 386. Journ. Bot. 1898, 489; 1900, 144 (portr.). Fl. Warwicksh. 500, 502; Top. Bot. ed. 2, 549. *Dacrydium Kirkii* F. Muell.

Lankester, Phœbe, *née* Pope (1825–1900): b. 1825; d. London, 9 April, 1900; bur. Hampstead. Widow of Edwin Lankester. 'Wild Fl. worth notice,' 1861. 'Bot. for elementary schools,' 1872. 'Talks about Pl.,' 1879. Popular portion of Syme's 'Eng. Bot.,' 1863–72. Jacks. 237, 570. 'Times,' 14 April, 1900.

Lawson, Sir Charles (1794–1873): b. Edinburgh, 1794; d. Edinburgh, 21 Dec. 1873. Lord Provost of Edinburgh, 1861. 'Agriculturists' Manual,' 1836; 'Agrostographia,' ed. 4, 1853; 'Pinetum Britannicum,' 1866. Jacks. 133. Silva N. America, x. 120. *Cupressus Lawsoniana* A. Murr.

Lefroy, Sir John Henry (1817–90): b. Ashe, Hants, 28 Jan. 1817; d. Lewarne, near Liskeard, Cornwall, 11 April, 1890. Colonel R.A., 1855. K.C.M.G., 1877. Governor of Bermuda, 1871; of Tasmania, 1880. Plants at Kew. Bot. Challenger Exp. part ii. 5. Dict. Nat. Biog. xxxii. 399. Symb. Antill. i. 95; iii. 73. R.S.C. iii. 930; x. 552.

Lewin, John William (fl. 1805–8): A.L.S. Ornithologist and

entomologist. Drew N. S. Wales plants for Barron Field and others, 1805–8. Proc. Linn. Soc. N. S. Wales, 1902, 747. Proc. Linn. Soc. i. 299. Dict. Nat. Biog. xxxiii. 170.

Linacre, Rev. Thomas (1460–1524): b. Canterbury, 1460; d. London, 20 Oct. 1524; bur. in St. Paul's. M.D., Padua and Oxon. Prebendary of Westminster, 1517. Priest, 1520. Founder of Royal College of Physicians, 1518. 'Macer's Herbal,' 1542. Pult. i. 32. Munk, i. 12. Haller, i. 215. Dibdin's Ames, iii. 192. Dict. Nat. Biog. xxxiii. 266. 'Life,' by Noble Johnson, 1835. Portr. attributed to Matsys in Royal collection; engraved in Pettigrew's Medical Portr. Gallery.

Linton, William James (1812–98): b. London, 7 Dec. 1812; d. New Haven, Connecticut, U.S.A., 1 Jan. 1898. Engraver. 'Ferns of the Lake Country,' 1865. 'Memories' (autobiog.), 1895, w. photo-portraits. Jacks. 246. Dict. Nat. Biog. Supp. iii. 100.

Lowe, Edward Joseph (1825–1900): b. Highfield House, Notts, 11 Nov. 1825; d. Shirenewton Hall, Chepstow, 10 March, 1900. F.L.S., 1857. F.R.S., 1867. Experimented on hybridism fr., 1842. 'Fern-growing,' 1895. 'Ferns, Brit. and Foreign,' 1855–60, 8 vols., ed. ii. 1872. 'New and Rare Ferns,' 1862. 'Our Native Ferns,' 1867. 'Nat. Hist. of Brit. Grasses,' 1858. R.S.C. iv. 95; viii. 266; x. 640; xii. 460. Jacks. 575. Journ. Bot. 1900, 152. Gard. Chron. 1871, 803, w. portr. Portr. in 'Fern-growing.'

Macfarlane, Rev. George (d. 1884): d. Coldingham, Berwick, 1884. Ass. Bot. Soc. Ed., to which he sent pl. Paper on Berwicksh. pl. in Trans. Bot. Soc. Ed. xvi. 26: *op. cit.* 192.

Mackenzie, D. (d. 1800?): Engraver. Employed by Banks on plants of Cook's First Voyage. Engraved 27 plates of *Ericaceæ* in Francis Bauer's 'Delineations of Exotic Plants,' 1796. Pritz. nos. 494 and 498. "Tabulæ . . . inter omnes summi artificis facile pulcherrimæ." Pritz. Schrader, Journal, iv. 426. Journ. Bot. 1899, 182.

Mandeville, Henry John (1773–1861): b. Suffolk, 1773; d. Buenos Ayres, 16 March, 1861. H.B.M. Minister at Buenos Ayres. Introduced "many interesting plants," Bot. Reg. 1840, t. 7. *Mandevilla* Lindl.

Mansel-Pleydell, John Clavell, *né* **Mansel** (1817–1902): b. 4 Dec. 1817; d. Whatcombe, Dorset, 2 May, 1902; bur. Clenston, Dorset. B.A., Camb., 1839. F.L.S., 1870. Pres. Dorset Field Club, 1875–1902. 'Flora of Dorset,' 1874, ed. ii. 1895. Herbarium at County Museum, Dorchester. Jacks. 251. Journ. Bot. 1902, 260, w. portr.

March, William (c. 1795–c. 1872): d. Jamaica, 1872. Secretary to Governor, 1868. Had a herbarium. Sent plants to Kew, &c. Symb. Antill. iii. 81.

Maries, Charles (d. 1902): b. Stratford-on-Avon; d. Gwalior, India, 11 Oct. 1902. F.L.S., 1887. Plant-collector for Veitch in Japan and China, 1877–79. Superintendent Gwalior Gar-

dens. 'Rambles of a Plant-collector' in 'Garden,' 1877–80. Plants at Kew and Brit. Mus., Gard. Chron. 1902, ii. 360 (portr.); Bretschneider, Bot. Discov. in China, 741. *Fraxinus Mariesii* Hook. fil.

Marnock, Robert (1800–1889): b. Kintore, Aberdeensh. 12 March, 1800; d. London, 15 Nov. 1889; bur. Kensal Green, 1840. F.L.S., 1846. Curator Sheffield Bot. Garden, 1834, and Regent's Park Garden. Associated with Deakin in 'Florigraphia Britannica,' 1835–41. Edited 'Floricultural Magazine,' 1836. Jacks. 236. Dict. Nat. Biogr. xxxvi. 192. Gard. Chron. 1882, 565; 1889, 588, w. portr.

Marshall, Moses (1758–1813): b. West Bradford, Chester Co., Pennsylvania, 30 Nov. 1758; d. same place, 1 Oct. 1813. Nephew of Humphrey Marshall, whom he helped in preparing 'Arbustrum Americanum.' Sent plants to Europe. "A good practical botanist." Memorials of Bartram, 546. Harshberger, 'Botanists of Philadelphia,' 97. *Marshallia* Schreb.

Mathews, William (1828–1901): b. Hagley, Worcester, 10 Sept. 1828; d. Tunbridge Wells, 5 Sept. 1901. M.A., Camb., 1856. President of Alpine Club, 1868–70. Friend of Babington and Newbould. Contrib. to 'Phytol.,' 'Journ. Bot.,' Bagnall's 'Fl. of Warwicksh.,' Lees' 'Bot. of Worcestersh.' and 'Clentine Rambles,' 1868. 'Fl. of Algeria,' 1880. 'Flora of Clent and Lickey Hills,' 1881. 'Hist. of Bot. of Worcester' in 'Midland Naturalist,' 1887–93. Worcester pl. at Worcester Museum; others at Kew. Jacks. 347. R.S.C. viii. 353; x. 744. Journ. Bot. 1901, 352, 428; 'Alpine Journal,' 20 Nov. 1901, 521; Trans. Surveyors' Instit. 1901–2, 525.

Mead, Richard (1673–1754): b. Stepney, 11 Aug. 1673; d. London, 16 Feb. 1754; bur. Temple Church. Ph.D., and M.D., Padua, 1695. M.D., Oxon., 1707. F.R.S., 1703. F.R.C.P., 1716. 'The Mæcenas of his day.' Paid Ehret £400 for 200 drawings. 'Memoirs,' by M. Maty, 1755; 'Lives of Brit. Physicians,' 155; Nich. Anec. i. 269; vi. 212–223; Linn. Corr. ii. 481; Munk. ii. 40. Dict. Nat. Biog. xxxvii. 181. Monument w. bust, N. aisle, Westminster Abbey; Bust by Roubilliac at R.C.P.; Wedgwood medallion; Engr., 1749, fr. painting by Ramsay and mezzotint. *Meadia* Catesby = *Dodecatheon* L.

Meehan, Thomas (1826–1901): b. Potter's Bar, near Barnet, 26 March, 1826; d. Philadelphia, U.S.A., 19 Oct. 1901. Kew gardener, 1846–8. Nurseryman at Germantown, Penns. fr. 1853. Y.M.H., 1901. Correspondent of Darwin. 'Native Fl. of the United States,' 1878–80. Jacks. 509. Silva N. Amer. ix. 82; Harshberger, 'Botanists of Philadelphia,' 249 (portr.). Gard. Chron. 1901, i. 296, 383 (portr.). Journ. Bot. 1902, 38, w. portr. R.S.C. iv. 319; viii. 368. Journ. Kew Guild, 1894, 38; x. 761; xii. 496.

(To be continued.)

SHORT NOTES.

Ambrosia trifida L.—I send you specimens of *Ambrosia trifida*, which we have found on a railway-bank near Ramsgate this autumn. The plant first came under my notice last summer (1902), when it was found by my friend Mr. Hewitt in a potato-patch near Margate, among a lot of Chenopods, which it superficially resembles. This plant, when I saw it last year, was fully grown, about 3½ or 4 feet high, and much branched. The plant, when first seen in June, bore only the *male* inflorescence at the ends of the branches; shortly after the female flowers developed. It is not to be found this year in the Margate locality. At the end of two or three weeks, when the female flowers were fully developed, the male catkins fell off and disappeared, and the green pistillate flowers alone were to be seen. So that the plant when first examined appeared to bear *male* catkins only, and at a later stage only *female* flowers could be found, and it might easily be mistaken for a dicœcious male or female plant, according to the stage of development at which it might be examined.—George M. Pittock.

[This *Ambrosia* seems to be of frequent occurrence this year; we have received it from Stonyhurst, Lancashire, and have heard of it as growing at Southport.—Ed. Journ. Bot.]

"A Note on Hybrids."—Dr. Gilbert's paper (pp. 348-350), with much of which I agree, shows how easily conciseness of expression leads to misunderstanding. I have raised no phantom; in his recent work on brambles Dr. Krause has practically ascribed the variableness of the German forms to hybridity alone. The case of *Primula elatior*, &c., is, I must insist, not strictly parallel to that of the Tunbridge Wells common Rubi: on the one hand we have to deal with three well-marked species and their hybrids; on the other hand with numerous forms of a most polymorphic genus largely represented in Britain. and still to a considerable extent indeterminate. The seeds of *Primula* are not usually conveyed by birds from place to place; those of *Rubus* are, I believe, mainly thus conveyed, so that the hybridity of their "varieties" in a given spot is far less probable. I cannot deny that some of our "varieties," and even "species," may have had a hybrid origin; but it is dangerous to assume this too readily. My experience is that evident (spontaneous) bramble hybrids, though not always totally sterile, are markedly so, compared with their parents. In case of their extension by rooting at the tips, this greater sterility may gradually disappear; but I am not aware of any proof that such is the case. At Ham Ponds, E. Kent, there is a considerable space covered with *R. cæsius* × *Idæus*, yet a root brought thence produced no more than an odd drupelet or so during several seasons' cultivation.—Edward S. Marshall.

Geaster fornicatus in Berks.—As this curious fungus is rare, it may be worth while putting on record its occurrence near Arding-

ton, in the Kennet Valley, Berks, where Prof. Weldon, F.R.S., of Oxford, recently found it.—G. Claridge Druce.

Orobanche rubra Sm. = O. alba Steph.—The Rev. A. Woodruffe-Peacock sent me an *Orobanche* gathered by Miss E. F. Lewin in 1897 in Cawthorpe Woods, near Louth, N. Lincolnshire. I could not at once determine it, and at last sent it to Dr. Gunther Beck, the monographer of the genus. He has replied that it is *O. alba* Stephan var. *communis* Beck, Mon. 209. It seems that we shall have to give up Smith's name, as the dates are as under :—

Orobanche alba Stephan ex Willd. Sp. Pl. iii. 350 (1800).

O. epithymum DC. Fl. Fr. iii. 490 (1805).

O. rubra Sm. Eng. Bot. t. 1786 (1807).

O. epithymum DC. var. *purpurascens* Brügg. in Fl. des Unterengadins (Jahresb. der Naturf. Gesellsch. Graubündens, xxxi, Beilage, p. 139 (1887–8)).

Mr. Peacock writes that he knows of no soil at Cawthorpe in which *Thymus* would be likely to grow, though he thinks there might be a small patch of "sandy glacial gravel" in the wood, and on this it might grow. This will be a work for next year to determine. Dr. Beck has also named specimens I was in doubt about for the Isle of Skye, v.-c. 104, as *O. alba* Steph. f. *bidentata* Beck, Mon. In addition to the records in Top. Bot. ed. 2, p. 301, the species is recorded from :—62 York N.E., *Webster* sp., a very fine form; I have not yet been able to dissect it, but if any of our species it is this. 73 Kirkcudbr. *J. McAndrew MS.* 97 Westerness, *Macvicar* sp. 102 Ebudes, *S. Grieve*, Journ. Bot. 1882, 313. 110 O. Hebrides, *Duncan* sp.—Arthur Bennett.

Trifolium resupinatum L. in Sussex (p. 350).—This plant was found in Sussex by Mr. T. Hilton in 1889, at Kingston-by-Sea, and in 1894 at Henfield, and both records are to be found in Journ. Bot. 1901, p. 408.—C. E. Salmon.

Nathaniel John Winch. —The date of this botanist's birth seems hitherto unknown, but I have recently lighted upon a memorandum in his handwriting, in his correspondence, which gives some interesting particulars. From it we learn that he was born at Hampton, Middlesex, on 26th December, 1768; went to Newcastle in January, 1786; travelled in Germany, south of Europe and France in 1790–91; was married on 4th May, 1795, at Chester-le-Street Church, Durham; and that his wife died on 28th November, 1826. His British herbarium was the foundation of that now in the possession of the Linnean Society, increased by contributions from the herbaria of Withering and other collectors; his general herbarium was presented by the Linnean Society in 1863 to the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne. It is a common mistake to suppose that the whole of Winch's collections went north; all his British collection, and his correspondence, remained at Burlington House. —B. Daydon Jackson.

NOTICE OF BOOK.

Morphology of Angiosperms (*Morphology of Spermatophytes.* Part ii.) By J. M. Coulter, Ph.D., and C. J. Chamberlain, Ph.D. 8vo, pp. x, 348; figs. 113. 1903. Appleton: New York. Price not stated.

While, on the one hand, the tendency of recent work has been to emphasize the relationship of the Gymnosperms to the Pteridophyta, and, by the recognition of an intermediate group, Cycadofilices, to bridge the separating gulf, there is, on the other hand, a growing feeling that Angiosperms and Gymnosperms are less intimately associated than has been implied in their arrangement as members of one great sub-kingdom, Seed-plants or Spermatophytes. This latter view finds expression in the mode of issue of the volume now before us. Two years ago Drs. Coulter and Chamberlain published what was intended to be the first part of a work on the Morphology of Seed-plants—an account of the Gymnosperms. At that time, to quote the preface to the present volume, "it was our purpose to issue as a second part an account of the Angiosperms, which would also contain a complete index of the whole work. We have become convinced, however, that such an association of these two great groups would help to emphasize a relationship that does not exist, and that Gymnosperms and Angiosperms should be treated as independent groups, co-ordinate with Pteridophytes." The present volume is therefore issued not as Part ii. of *Morphology of Spermatophytes*, but as an independent volume, entitled *Morphology of Angiosperms;* and any subsequent edition of the previous volume will be entitled *Morphology of Gymnosperms.* In this decision the authors will assuredly have the sympathy of some working botanists as well as some teachers of the science who are in the habit of reflecting on the subject-matter which they set before their students.

This volume, like its predecessor, has grown out of a course of lectures and laboratory work given at Chicago University to classes of graduate students preparing for research. While, therefore, it will be welcomed as organizing a vast amount of material scattered through papers in very various publications, some of which are not readily accessible, it has the additional advantage of presenting statements which have been confirmed by members of the botanical staff and by numerous students, whose results have also served to contribute no small amount of new material.

In the treatment of the Gymnosperms the great divisions were taken separately because of their marked differences; in Angiosperms, however, there is not that great diversity in special morphology such as we find, for instance, between Cycads and Conifers. Hence the subdivision of the book which is adopted is not a "systematic" one, but runs on the lines of the course of life-history. Even in the case of the two main divisions, Monocotyledons and Dicotyledons, though they are recognized as

two very distinct groups, the essential morphology is so similar that separate treatment would involve needless repetition; especially as the distinguishing characters are those of the vegetative sporophyte, the sporangia and gametophytes having so far supplied no evidence of group distinctions.

Chapter ii., which follows the short introductory one, deals with the flower in general. A strict definition of the flower as the characteristic part of the seed-plants seems impossible—it is either too broad or not broad enough. As regards the origin of the flower, the authors do not follow what they describe as the current view, namely, that all floral leaves are derived from sporophylls. They consider it to be more in accord with present morphological conceptions not to limit too rigidly the possible origin of a structure, and we note with satisfaction their expression of adherence to the view that floral leaves in general may have been derived from contiguous structures both above and below. In their opinion, too, the vast majority of simpler flowers are better regarded as primitive than reduced forms. In the two following chapters, which deal respectively with the microsporangium and macrosporangium, attention is drawn to the numerous cases of a cauline as opposed to a foliar origin of the sporangium, especially in the case of the ovule, and it is suggested that the cauline origin should not be regarded as indicating the primitive character of the group in which it occurs.

Space will not allow us to follow in detail the successive treatment in the following chapters of the male and female gametophyte (which is regarded as beginning with the division of the spore mother-cell) fertilization, the endosperm and the embryo. They form collections of facts of the highest interest and teeming with suggestion, while the references to literature, if not exhaustive, will at any rate supply students with a great deal of further information; for instance, the list of literature cited at the end of the chapter on the embryo comprises ninety-five titles.

The next three chapters—x., xi., xii.—deal with classification, and are a useful presentation of the series or cohorts of the Monocotyledons and the two divisions, *Archichlamydeæ* and *Sympetaleæ*, of the Dicotyledons, as adopted by Engler in his recent *Syllabus*. The geographic distribution of the Angiosperms is the subject of the next chapter, a short one, but containing some useful generalizations which the student can test for himself. A brief chapter follows on fossil Angiosperms, which shows chiefly how poor and scrappy is our knowledge in this branch and how dangerous it must be to base any far-reaching statements thereon as to phylogeny or affinity.

Finally, under the title *Phylogeny and Angiosperms*, the authors briefly discuss the various views which have been put forward as to the origin of the group and its two great divisions. Their views are thus summed up. The Monocotyledons and Dicotyledons represent two independent lines derived directly from the Pteridophyte stock, probably from the Filicales. At the same time the

arguments in favour of the monophyletic origin of Angiosperms are strong; and if this view be accepted, the derivation of Monocotyledons from primitive Dicotyledons seems to rest on stronger evidence than the reverse relationship. It must also be said that the Gymnosperm origin of Angiosperms is not to be discredited so much now as formerly. It is, however, only necessary to read the chapter to see how conflicting is the evidence, or the views drawn from the evidence, in almost every point.

A general account of the comparative anatomy of the Gymnosperms and Angiosperms occupies the last twenty pages of the text; it is contributed by Professor E. C. Jeffrey, and is a valuable presentation of this phase of the subject and its bearing on phylogeny from the point of view of modern work.

The volume is well supplied with excellent and helpful figures, many of which are either new or are owed to the school of botany with which Drs. Coulter and Chamberlain are associated. Professor Jeffrey's contribution is illustrated by a good series of microphotographic reproductions.

A. B. R.

BOOK-NOTES, NEWS, &c.

The second and third parts of Georg Roth's *Die Europäischen Laubmoose* (Leipzig: Engelmann. Pp. 129–384; tabb. viii–xxvi, xlix. Price 4 marks each) finish the account of the cleistocarpous mosses and make good progress with that of the *Acroearpi*. The families treated are the *Phascaceæ*, *Bruchiaceæ*, *Voitiaceæ*, *Seligeriaceæ*, *Angstroemiaceæ*, *Weisiaceæ*, *Cynodontiaceæ*, *Dicranaceæ*, *Leucobryaceæ*, *Campylosteliaceæ*, *Leptotrichaceæ*, *Pottiaceæ*, and *Fissidentaceæ*. The complete work, about ten or twelve parts, with 106 plates, will form two volumes, the second of which will contain the *Bryaceæ*, *Polytrichaceæ*, and *Pleurocarpi*. The *Sphagnaceæ* will not be included. All the mosses of Europe will be described and figured; hence the book will be of great value to moss-students.

Ch. Ed. Martin (*Matériaux pour la Flore cryptogamique Suisse*; Berne, Wyss, 10 fr.) has done a careful piece of work in taking up the *Boletus subtomentosus* and tracking it through all its changes of form. He describes and figures eleven different forms of the same fungus, which he designates subspecies, and to which he has given distinctive names. Among these he has included *B. chrysenpteron*, one of our commonest and most easily diagnosed species. One character alone distinguishes all the individuals of *B. subtomentosus* that he has described: the yellow colour of the flesh, tubes, pores and stalk, and even that, he finds, is not absolutely to be relied on. His drawings show the extreme variability of the fungus. Mycology would be overwhelmed by its own literature were an equally extensive monograph written on every species or series of species. Such an example of variability is, however, a good object-lesson for the student.—A. L. S.

It is difficult to take M. Emile Boulanger seriously in the work that he has so laboriously carried out on the germination of the truffle spore (*Germination de l'Ascopore de la Truffe*: Oberthur, Rennes, Paris); his recorded observations and drawings are so extraordinary, and his methods are so very unconvincing. When you read of an ascospore developing two antheridia, getting itself fertilized by both, and then somehow becoming an oogonium and forming weird filaments, you feel that the matter has passed beyond comprehension or criticism. M. Boulanger sends us another series of observations (*Les Mycelium Truffiers Blancs*) on the conidial forms assumed by the truffle hyphæ. First a *Monilia* grew, then *Acrostalagmus cinnabarinus*. Boulanger is quite sure about these two forms, but he has also noted *Stachylidium*, and possibly a form of *Amblyosporium*. This part of the research has been amply criticized by M. Matruchot, who has grown truffle mycelia in the ordinary humdrum way, and has got plentiful growth of hyphæ, but no conidial forms. He does not accept M. Boulanger's results. We agree with M. Matruchot.—A. L. S.

Mr. G. F. Strawson has issued a booklet on *Standard Fungicides and Insecticides in Agriculture* (London, Spottiswoode, price 1s. 6d.) which will doubtless be useful to growers of crops. He has taken considerable pains to explain the methods of preparing and applying the sprays. He claims to have devised a substance that will destroy insects in the soil—a most useful discovery if it prove effectual. He adds notes on the destruction of charlock in corn crops.

Dr. J. K. Small, of the New York Botanical Garden, has issued a large and handsome volume dealing with the *Flora of the Southeastern United States*, which we hope to notice in an early issue.

A notice of the Rev. W. R. Linton's *Flora of Derbyshire*, to which we referred on p. 352, is unavoidably held over until our next number.

We note that Mr. Hemsley's name appears on the cover of the September and subsequent issues of the *Botanical Magazine* as "assisting" Sir Joseph Hooker in the preparation of that work. The descriptions in the October number are mostly from his pen.

MM. Baillière et fils (Paris) have published (price 12 fr. 50) what is practically a reissue of M. A. Acloque's *Flore de France*, with a new title-page, an additional preface, and 44 pages intercalated, giving the distribution of the species in the north of France. The new title-page—*Flore du Nord de la France*—is nevertheless, we think, somewhat misleading, seeing that the volume includes the whole French flora. The volume itself, as we said on its first appearance in 1894, is an excellent guide to French botany, rendered easily workable by its synoptical tables, and additionally useful by its numerous illustrations.

NEW BRITISH BASIDIOMYCETES.

By Worthington G. Smith, F.L.S.

Agaricus (*Amanita*) junquilleus Quél. in Bull. Soc. Bot. de Fr. vol. xxiii., 1876, p. 324, pl. 3, fig. 10. This differs from *A.* (*Amanitopsis*) *adnatus* W. Sm. in the striate margin of the pileus, in the presence of an annulus, and in the much smaller spores. Dr. Plowright states that he has seen the two plants growing together, and that he takes *A. adnatus* to be an exannulate form of *A. junquilleus*, an opinion with which I do not agree. There is a drawing of *A. junquilleus* by Mr. George Massee in the National Herbarium, named "*Agaricus sub-adnatus* sp. nov." Diam. of pileus $4\frac{3}{4}$, height $5\frac{1}{4}$ × diameter of stem at middle $\frac{5}{8}$ in.

Agaricus (*Lepiota*) nigro-marginatus Mass. Pileus campanulato-expanded, subumbonate; scales umber on a pale sienna-ochre ground. Stem hollow, attenuate upwards, smooth, salmon white; annulus distant, persistent, membranous, white. Gills broader in front, whitish; edge bordered with dark umber. Flesh thin. $2 \times 2\frac{3}{4} \times \frac{1}{8}$ in.

Amongst grass, Scarborough, May, 1885.

Allied to *A. clypeolarius* Bull., and especially to *A. felinus* Pass., but differing from both in the dark-edged gills. This description is drawn up from the original drawing and notes in the British Museum. Mr. Massee's imperfect description in Eur. Fung. Fl. p. 10, is insufficient for identification, the dark-edged gills not even being mentioned.

Agaricus (*Lepiota*) atrocroceus W. G. Sm. Pileus expanded, slightly depressed; bright salmon-orange; more or less covered with purple-brown, almost black, granular flocci. Stem hollow, attenuate upwards; bright salmon-orange; salmon-brown squamulose. Annulus fugacious. Gills broadly adnate; salmon white. Flesh thin; salmon-orange-brown. $1\frac{1}{2} \times 1\frac{1}{4} \times \frac{1}{8}$ in.

Clevedon, Somerset, Oct., *Edwin Wheeler*.

Allied to *A. granulosus* Batsch and *A. amianthinus* Scop. Drawing in British Museum. A brief and insufficient description of this is in Mass. Eur. Fung. Fl. p. 11.

Agaricus (Pleurotus) **rufipes** Mass. & W. G. Sm., sp. n. Pileus dimidiate or reniform, convex, membranous, very glutinous when moist; white; middle salmon, margin incurved. Stem becoming recurved; viscous-reddish; salmon red within; white in centre; base downy. Gills adnate, broad, distant; white; interstices pale salmon. Pileus $\frac{1}{8}$ in. diam., stem $\frac{3}{16}$ in. long, $\frac{1}{40}$ in. diam.

On wood.

Drawing by G. Massee in British Museum.

Agaricus (Nolanea) **rhodosporus** Broome & W. G. Sm., sp. n. Pileus convex; sooty-fibrillose or rufescent-pilose. Stem sub-bulbous; white. Gills sinuate or free, salmon or rose. $1 \times 1\frac{1}{4} \times \frac{1}{16}$ in.

On earth and wooden labels in stoves. May–September.

Allied to *A. rubidus* Berk. Examples and drawings in British Museum.

Agaricus (Hypholoma) **pseudo-storea**, sp. nov. Pileus convex, obtuse or subumbonate, then expanded, fleshy; at first purplish-brown with a darker middle, soon breaking up into large, fibrillose, purplish-brown scales, silky-white to pale fawn beneath the scales; margin appendiculate and entire when young. Stem hollow, equal or attenuate downwards, at first even, then silky-brown-fibrillose; white above, pale yellowish below. Gills adnate, at first white, then rose, becoming brown to purple-brown; not exuding drops of water. Usually cæspitose, sometimes solitary. Taste insipid, somewhat disagreeable; odour strong, disagreeable. Spores 5–7 × 2·5–3 μ. $2\frac{7}{8} \times 4\frac{1}{2} \times \frac{1}{2}$ in.

Woods, plantations, under larches. Sept.–Nov.

This is the plant usually described, when found in this country, as *A. storea* Fr. Dr. Plowright thinks it is *A. lacrymabundus* Fr., but as our plant never has any tear-drops it can hardly be *A. lacrymabundus*. Spores of *A. lacrymabundus*, 9 — 11 × 6 μ. A series of drawings in British Museum.

Paxillus porosus Berk. Not unlike *P. involutus* Fr., to which it is allied, but the margin is never involute, and the pores are sulphury-green, changing to pale blue or brownish when bruised, dull green when old. The pores in *P. involutus* are pallid, pale or umber-yellow to ferruginous, changing to vinous when bruised. $4\frac{3}{8} \times 3\frac{7}{8} \times \frac{3}{4}$ in. Tasteless, odour very strong, unpleasant.

Moist woods, under firs.

Small forms somewhat resemble *Boletus piperatus* Bull. Drawing of British examples, and specimens of foreign, in British Museum.

Lactarius sanguifluus Fr. A notable addition to our flora, closely allied to *L. deliciosus* Fr., which it greatly resembles, but the milk, in place of being orange, is deep blood-red changing to green. $2\frac{1}{2} \times 2 \times \frac{3}{4}$ in.

Wick, Oct. 21, 1845.

Placed by Fries next to *deliciosus* Fr., but Massee, Eur. Fun. Fl., p. 64, has placed it in a different section, because, he says, the milk is acrid in *deliciosus*, and mild in *sanguifluus*. Fries, indeed, says the milk of the latter is "mitis," but Bresadola, who has recently illustrated and described the species at considerable length (*Fungi Tridentini*), p. 21, says, "lac piperatum" and "caro acro-piperata." Drawing in British Museum.

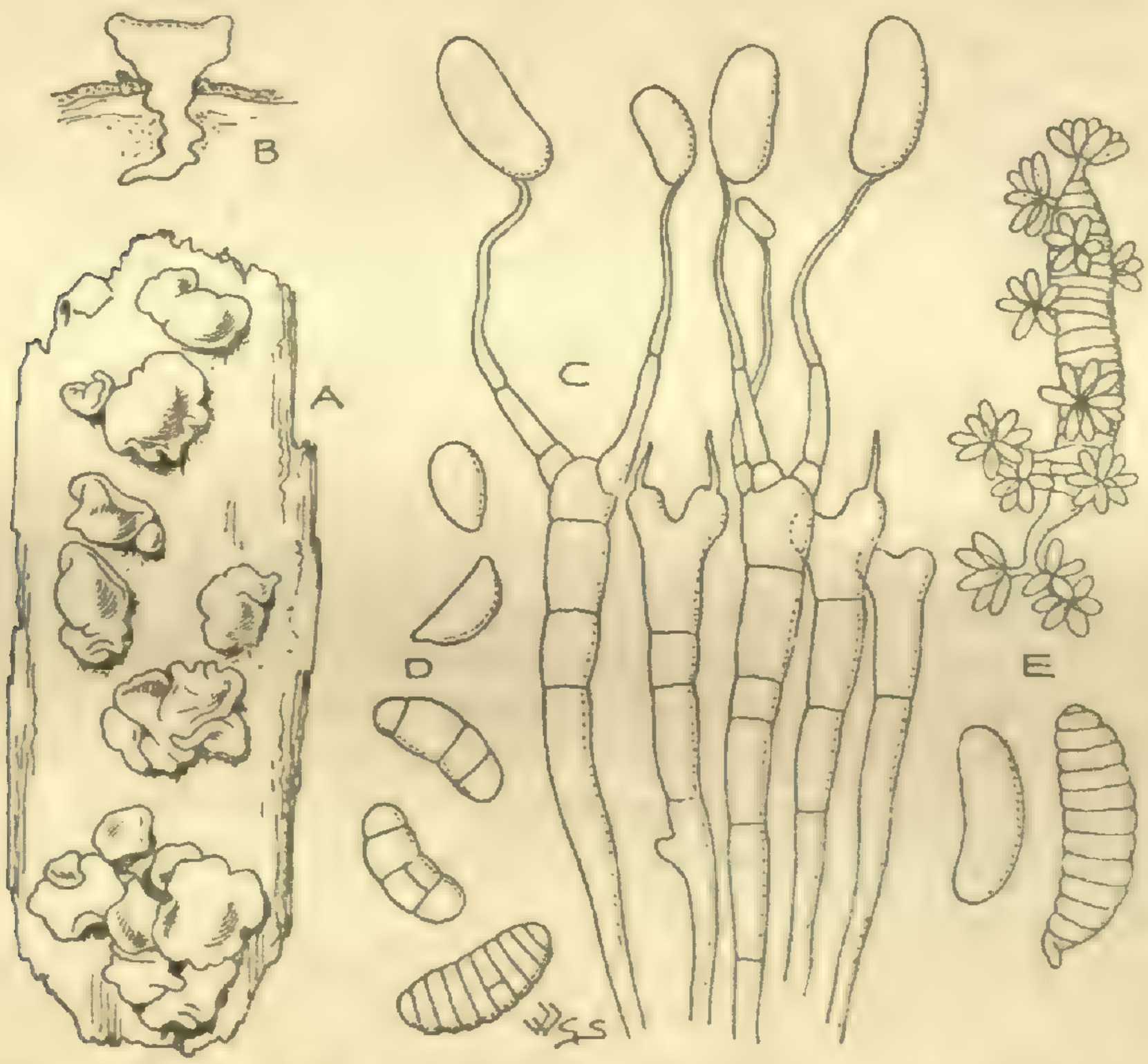
Polyporus obliquus Fr.
Guildford, Feb. 1883, *C. E. Broome*.
Effused 3 × $2\frac{1}{4}$ ins. Example in British Museum.

Merulius confluens Schwein.
Leigh Wood, Clifton, Aug. 1843, *C. E. Broome*.
Example in British Museum.

Cyphella griseo-pallida Weinm. $\frac{1}{16}$ in. diam.
On elm and elder-bark, Dec. 1873, *C. E. Broome*.

Distinct from *C. griseo-pallida* Berk. (*Outlines*, p. 277); renamed *Berkeleyi* by Massee. The latter plant grows on *Carex paniculata*. Examples in British Museum.

FEMSJONIA LUTEO-ALBA Fr. This plant was described as British by Dr. C. B. Plowright in Trans. Brit. Mycol. Soc. i. p. 200 (1902), and is introduced here for the sake of the illustration, drawn from nature. Soon after finding this plant, Dr. Plowright sent dried specimens for illustration in the series of drawings of Basidiomycetes in the British Museum, and for incorporation in the National Herbarium. On placing the examples in damp bibulous paper they immediately revived, and took their original shape. The basidia and spores were then easily observed under the microscope. The fungus and section is shown one-half natural size at



Femsjonia luteo-alba Fr., one-half nat. size; basidia and spores, × 500.

A, B, and the basidia and spores at C and D × 500; the spores become multiseptate at maturity, as illustrated. The three figures at E are taken from Brefeld (Untersuch. der Mycolog. vii. p. 161, 1888, t. x. f. 3–5), and represent the fruit of *Guepinia Femsjoniana* Olsen. This is probably *Femsjonia luteo-alba* Fr. The upper spore shows sporidiola. These I could not find on Dr. Plowright's examples.

GEASTER UMBILICATUS Fr.
Hereford, Nov. 1870.
Incurved exoperidium 1½ in. diam. Drawing in British Museum.

THE MOSSES AND HEPATICS OF WORCESTERSHIRE.

By James E. Bagnall, A.L.S.

(Concluded from p. 371.)

Barbula lurida Lindb. Shakenhurst, *cft.*; Wyre Forest; Frankley Hill, *cft.* — *B. rubella* Mitt. Frequent. — *γ ruberrima* Braithw. Alfrick, *cft.*; Suckley; Malvern Hill; Knightwick; Alvechurch, *cft.*; Wyre Forest; Carpenters Hill Wood. — *B. tophaceum* Mitt. Alderminster; Alvechurch; Barnt Green; Hopwood; Northfield; Hanley Child, &c.—*B. fallax* Hedw. Frequent. —*β brevifolia* Schultz. Hanley Dingle; Dick Brook; Offmoor Wood; Offmoor; Wyre Forest.—*B. spadicea* Mitt. Bredon Hill; Harvington; Old Storridge Common; Knighton-on-Teme; Barnt Green; Frankley Hill.—*B. rigidula* Mitt. Bredon Hill; Peopleton; Tardebig; Rubery; Dudley Castle. — *B. cylindrica* Schimp. Cowleigh, *Towndrow*! Blockley; Broadway; Ravens Hill; Malvern, &c. — *B. vinealis* Brid. Broadway; Suckley; Malvern Hill, *cft.*; Knightwick; Alvechurch; Pensax; Wyre Forest, *cft.*; Frankley Hill. — *B. sinuosa* Braithw. Alderminster; Croome Park; Rous Lench; Bow Bridge; Dick Brook, Pensax.—*B. Hornschuchiana* Schltz. Worcester, *Towndrow*! Croome Park; Goose Hill, near Droitwich; Alfrick; Shatterford; Frankley Hill, &c.—*B. revoluta* Brid. Blockley; Longdon; Upthorpe Bridge; Castleton; Hopwood; Frankley Hill, &c. — *B. convoluta* Hedw. Frequent. In fruit at Ravens Hill; Hartlebury Common; Offmoor Wood; Rhyd Covert; Habberley Valley. — *B. unguiculata* Hedw. Frequent.— *β cuspidata* Braithw. Defford; Ravens Hill; Alfrick; North Malvern; Shrawley.—*γ apiculata* Hedw. Old Storridge Common.

Leptodontium flexifolium Hpe. Old charcoal stools, Wyre Forest.

Weissia crispa Mitt. Malvern, *Lees*.—*W. squarrosa* C. M. Canal bank near Droitwich.—*W. microstoma* C. M. Malvern Hill, *Griffiths*! Stagsbury; Weston Park, near Droitwich; Bewdley; near Arley Wood; Rhyd Covert; Starts Green, near Kinver; Hagley; Moseley. —*W. tortilis* C. M. Bredon Hill.—*W. viridula* Hedw. Frequent. —*β amblyodon* B. & S. Seckley Wood; Bell End.—*W. mucronata* B. & S. Dick Brook, Pensax; Gladders Brook, Ribbesford Wood; Wyre Forest; Seven Hills, near Kidderminster; Moseley.—*W. tenuis* C. M. River Teme, Hanley Dingle; canal-bank, Alvechurch; Rubery; quarry near Halesowen. — *W. verticillata* Brid. Sapey Bridge, *Ley*; River Teme, Hanley Dingle; South Stone Martley; Hanley Child; Upper Arley.

Trichostomum crispulum Bruch. Rous Lench; Church Lench; Ravens Hill and Crows Hill, Alfrick; Wyre Forest; Arley Wood. —*T. mutabile* Bruch. Frankley, 1870; Wyre Forest.—*β littorale* Dixon. Limestone rocks, Wyre Forest. — *T. tortuosum* Dixon. Malvern Hills, *Lees*; Worcestershire Beacon; Wyre Forest.— *γ fragilifolium* Dixon. Wyre Forest.—*T. tenuirostre* Ldb. Seckley Wood.

Cinclidotus Brebissoni Husn. Near Stockton-on-Teme, *Town-*

drow! Armscote; Cleeve Priors; Pershore; Peopleton; Feckenham; Leigh Sinton; Hamstall Ferry; Weston Park, Droitwich; Upper Arley.—*C. fontinaloides* P. B. Stockton-on-Teme, *Towndrow*! Cleeve Priors; Hamstall Bridge; Brokenhurst; Stourport; Upper Arley; River Rea, Moseley.

Encalypta vulgaris Hedw. Blockley; Broadway; Bredon Hill; Hanley Child; Habberley Valley; near Clent.—*E. streptocarpa* Hedw. Blockley; Broadway; Bredon Hill; Hollybush Hill; Malvern; Alfrick Pound; Hanley Child; Shakenhurst; Menith Hill; Abberley Hill; Arley Wood; Lickey Hill.

Zygodon Mougeotii B. & S. Worcestershire Beacon, *Lees*; Alfrick; Wyre Forest.—*Z. viridissimus* R. Br. Alvechurch, *Russell*; Aston Magna, *cft.*; Hanley Child. Frequent.—*β rupestris* Lindb. Ravens Hill, Alfrick.

Ulota Bruchii Hornsch. Cowleigh Park, *Lees*; Eastham; on trees, Dick Brook.—*U. crispa* Brid. Shelsey Walsh; near Blackwell; Offmoor Wood; North Wood, Bewdley.—*β intermedia* Dixon. Blackwell; Dick Brook, Pensax; North Wood, Bewdley; Wyre Forest; Upper Arley.

Orthotrichum anomalum Hedw. Middle Hill, Malvern, *Lees*; Alderminster.—*β saxatile* Milde. Broadway!, Malvern!, *Lees*; Blockley; Aston Magna; Bredon Hill; Newbould-on-Stour; Leigh Sinton; Martley; Blakenhall.—*O. cupulatum* Hoffm. Malvern Hill, *Lees*; old walls, Newbould-on-Stour; Bredon Hill; Hartlebury Common.—*β nudum* Braithw. By the Stour, Alderminster; Dowles Brook, Wyre Forest.—*O. leiocarpum* B. & S. Spout Farm, Eardiston; Stoke Bliss; Dick Brook, Pensax.—*O. Lyellii* H. & T. Frequent, always barren.—*O. affine* Schrad. Frequent in South Worcestershire; local in the north.—*β rivale* Wils. Near Alderminster; Dick Brook, Pensax.—*O. rivulare* Turn. Lickey Hills, *Lees*; near Stockton-on-Teme, *Towndrow*! Alderminster; Goose Hill Green, near Droitwich; Weston Park, Droitwich; Shakenhurst; River Severn, near Seckley; River Rea, near Moseley.—*O. Sprucei* Mont. Tree-roots by the Severn near Upper Arley.—*O. stramineum* Hrn. Trees by Piddle Brook, Radway.—*O. tenellum* Bruch. On ash trees near Tredington.—*O. diaphanum* Schimp. Longdon Marsh; Broadway; Alderminster; Cleeve Prior; Harvington; Pershore; Standon Bridge; Pensax; Moseley.—*O. obtusifolium* Schimp. On ash trees near Shipston-on-Stour.

Ephemerum serratum Hpe. Barnt Green; Lickeys; Stagbury Hill; Wyre Forest; Warshill Wood; Northfield; Kings Norton; Honington; Acocks Green; near Chatley Green.

Physcomitriella patens B. & S. Moseley, *Webb*! near Offmoor Wood; Kings Norton.

Physcomitrium pyriforme Brid. Paxford; Cleeve Prior; Lickey Hill; Righter Heath and Wythall Heath, near Kings Norton; Bell End; Moseley; Clent.

Funaria fasciculiaris Schimp. Malvern, *Lees*; Righter Heath, near Kings Norton; Hoar Stone, Bewdley; near Warshill Wood.—*F. hygrometrica* Sibth. Very common.—*β calvescens* B. & S. Rous Lench; near Lickey Hill; Dunley.

Amblyodon dealbatus P. B. Canal side near Hopwood Dingle canal side near Alvechurch.

Aulocomnium palustre Schwaegr. Malvern, *Bloxam*; Kempsey Common; Hartlebury Common; Lickey Hill; Pedmore; Seckley; Acocks Green; Spinney near Arley. — *A. androgynum* Schwaegr. Frequent.

Bartramia pomiformis Hedw. Near Cookley Wood, *Lees*; Malvern Hills; Ankerdine; Stourport; Kidderminster; Churchill; Bell End; Moseley; Blakeshall Common.

Philonotis fontana Brid. Bredon Hills; Malvern Hills; Old Storridge Common; Randan Woods; Lickey Hill; Wythall Heath, *cft.*; Rubery, *cft.*; Bewdley; Wyre Forest; Seckley. — *δ pumila* Dixon. Wyre Forest; Rhyd Covert, near Kidderminster. — *capillaris.* Old Storridge Common, on limestone rocks; Wyre Forest, on charcoal stools; Rhyd Covert, near Kidderminster.—*P. cæspitosa* Wils. Near Newbould-on-Stour; Malvern Hill; Butlers Hill, near Alvechurch. — *P. calcarea* Schimp. Menith Wood; Dick Brook, Pensax.

Leptobryum pyriforme Wils. Southstone Rock; Spout Farm, Eardiston; Shrawley; Oreleton; canal side, Alvechurch; Barnt Green; Coles Green; Bell End; Old Swinford.

Webera cruda Schwaegr. Malvern, *Lees*; Blakeshall.—*W. nutans* Hedw. Frequent. — *β longiseta* B. & S. Rubery; Hartlebury Common.—*W. annotina* Schwaegr. Near Tardebig; Barnt Green; Ombersley; Wythall Heath; Rhyd Covert, near Bewdley; Wyre Forest, &c.—*β tenuifolia* Schimp. Dowles Brook, Wyre Forest.—*W. carnea* Schimp. Longdon Marsh; Broadway; Feckenham; Defford Common; Ravenshill; Alvechurch; Churchill; Bewdley; Offmoor.—*W. albicans* Schimp. Alderminster; Wittington; Alvechurch; Lickey Hill; Rubery; Pensax; Wyre Forest; Seckley Wood, &c.

Bryum pendulum Schimp. North Hill, Malvern; Church Lench; Barnt Green; Old Swinford; Hartlebury; Halesowen; Kings Norton. — *B. lacustre* Brid. Bewdley; Harborne.— *B. inclinatum* Bland. Bredon Hill; North Hill, Malvern; Barnt Green; Rubery; Frankley; Northfield; Habberley Valley. A small variety abundant in drains, Frankley Hill.—*B. uliginosum* B. & S. Frankley Hill; near Bewdley.—*B. pallens* Sw. Broadway; Malvern; Stanford Bridge; canal side, Alvechurch; Frankley Hill; Warshill Wood.—*B. turbinatum* Schwaegr. Bromsgrove Lickey, *Purton*, iii. 82.—*B. bimum* Schreb. Teddington; Defford Common; Stockton Pool; Jockey Brook, Bewdley; Wyre Forest.—*B. pseudo-triquetrum* Schwaegr. Teddington; Defford Common; Stockton Pool; Hopwood Dingle; Wyre Forest.—*B. affine* Lindb. North Hill, Malvern; near Churchill.— *B. intermedium* Brid. Barnt Green; Frankley; Northfield; Old Swinford. — *B. cæspiticium* L. Frequent. — *B. capillare* L. Frequent. — *γ macrocarpum* Hübn. Ravenshill; Alfrick.—*ε flaccidum* B. & S. Broadway; Bransford Bridge; near Worcester; near Pensax.—*B. Barnesii* Wood. On lock-gates, Holt Fleet. — *B. atropurpureum* W. & N. Broadway; Littleton; Eastham; Stanford-on-Teme; Rubery; Righter Heath; North Wood,

Bewdley; Hagley Wood.—*B. gracilentum* Tayl. Footways, Defford; near Linscombe Locks; New Brook, Frankley; Halesowen railway station; Wribbenhall.—*B. murale* Wils. At Midsummer Hill, *Ley*; Suckley Hill; near Tundridge; Leigh Sinton; Worcestershire Beacon; Hanley Child; canal bridge, Acocks Green.—*B. Mildeanum* Jur. Wribbenhall, on walls.—*B. argenteum* L. Frequent.—*β majus* B. & S. Worcester, *Towndrow*! canal side near Hewell Grange; near Wythall, *cft.*—*γ lanatum* B. & S. Old walls, Alderminster; Offmoor; Halesowen railway; Seckley Wood.— *B. roseum* Schreb. Near Malvern Wells!, *Lees*; Old Storridge Common; Shrawley Wood; Golden Valley, Bewdley; Rhyd Covert, near Bewdley; Wyre Forest; Eymore Wood.

Mnium affine Bland. Canal side near Alvechurch; Shrawley Wood; Frankley Hill; Warshill Wood.—*β elatum* B. & S. Stanklin Pool, near Kidderminster.—*M. cuspidatum* Hedw. Worcester Beacon, *Lees*; Gladders Brook, Ribbesford; Areley Kings; Seckley Wood.—*M. rostratum* Schrad. Shrawley Wood; South Stone; Bewdley; Warshill Wood; Hagley; Churchill; Stanklin Pool, near Kidderminster; near Arley; Frankley Hill.—*M. undulatum* L. Frequent. In fruit, Malvern, *Lees*; Martley; Menith Wood; Lickey Hill; Hopwood Dingle; Bewdley; Upper Arley.—*M. hornum* L. Frequent.—*M. stellare* Reich. Old Storridge Common! *Towndrow*; Mathon; Tundridge, near Suckley; Shrawley Wood; Pensax; Woodcote Green; Churchill; Frankley Hill; Clent; Seckley, &c.—*M. punctatum* L. Frequent. In fruit, Old Storridge Common; Shrawley Wood; near Alvechurch; Hopwood Dingle; Pensax; Wyre Forest; near Upper Arley, *cft.*; Stanklin Pool; Warshill Wood; Frankley Hill.—*M. subglobosum* B. & S. Mathon; Old Storridge Common; Rock Coppice, Bewdley; Frankley Hill; Acocks Green.

Fontinalis antipyretica L. Cleeve Priors; near Malvern Link; Stockton-on-Teme; Goose Hill, near Hanbury; Barnt Green; River Severn, Bewdley; Wyre Forest; River Rea, Moseley.—Var. *γ gracilis* Schimp. River Severn, near Upper Arley.—*F. squamosa* L. River Severn, near Upper Arley.

Cryphæa heteromalla Mohr. Cowleigh Park, *Griffiths*! Holly-bush Hill and Brock Hill, *Lees*; Shipston-on-Stour; Broadway Hill and quarries; near Upper Arley.

Neckera crispa Hedw. Bredon Hill!, *Thompson*; Broadway; Wyre Forest; Seckley Wood; St. Kenelms.—*β falcata* Boul. Copse, Bredon Hill.—*N. pumila* Hedw. Berrington Wood, *Lees*; Malvern Hill, *Lees*.—*N. complanata* Hübn. Cleeve Priors; Harvington; Peopleton; Suckley; Knightwick; Martley; Rubery; St. Kenelms.

Homalia trichomanes Brid. Frequent.

Pterygophyllum lucens Brid. Moseley, *Westcote*; Shrawley Wood; Golden Valley, Bewdley; Wyre Forest; Seckley Wood.

Leucodon sciuroides Schwaegr. Frequent in the Avon Valley and south-east, rare or local in North Worcestershire.

Pterogonium gracile Sw. Ragged Stone Hill, Malvern, *Fraser*.

Antitrichia curtipendula Brid. Malvern, *Lees*.

Porotrichum alopecurum Mitt. Sapeybrook, *Lea*! Leigh Sinton;

North Wood, Bewdley; Wyre Forest; Seckley Wood; Frankley; Clent, in fruit, frequent barren.

Leskea polycarpa Ehrh. Frequent on tree-roots by streams and pools.—*β paludosa* Schimp. Pershore; Peopleton; Westwood Park, near Droitwich; Stanklin Pool, near Kidderminster; Seckley Wood; near Kidderminster.

Anomodon viticulosum H. & T. Longdon Marsh; Armscote; Bredon Hill; Wolverton, near Worcester; Suckley; Alfrick; Eastham; Stanford-on-Teme; Pensax; Wyre Forest; Westwood Park, Droitwich.

Heterocladium heteropterum B. & S. Wyre Forest!, *Fraser*; North Wood, Bewdley; Seckley Wood.—Var. *β fallax* Milde. North Wood, Bewdley; Wyre Forest; Seckley Wood, near Upper Arley.

Thuidium tamariscinum B. & S. Common.—*T. recognitum* Lindb. Wolverton, near Worcester.

Climacium dendroides W. & M. Malvern Hills; Barnt Green; Rubery; Stanklin Pool, near Kidderminster; Churchill.

Isothecium myurum Brid. Frequent.—Var. *robustum* Bry. Eur. Ravenshill, Suckley; Old Storridge Common; Teddesley Wood, near Pershore; Leigh Sinton; Seckley Dingle.

Pleuropus sericeus Dixon. Frequent.

Camptothecium lutescens B. & S. Frequent on calcareous soils. Armscote; Suckley; Martley; Wyre Forest, *cft.*, &c.—*C. nitens* Schimp. Rare, near Clent.

Brachythecium glareosum B. & S. Suckley; Malvern Hills; Wittington, near Worcester; Tardebig; Pensax; Abberley Hills; Kidderminster; Churchill; Wyre Forest; California, near Harborn.—*B. albicans* B. & S. Local throughout the county.—*B. salebrosum* B. & S. Malvern!, *Lees*; Croome Park; Suckley; Knightwick; Rubery; Twylands Wood, Frankley; Habberley Valley.—*β palustre* Schimp. Malvern Link, *Towndrow*! Bredon; Kempsey Green; Abberley Hills; North Wood, Bewdley; Wyre Forest; Seckley Wood.—*B. campestre* B. & S. Seckley Wood, near Upper Arley.—*B. rutabulum* B. & S. Frequent.—Var. *robustum* Schimp. Defford Common; Kempsey Green; Alvechurch; Pensax; Frankley, &c.—*B. rivulare* B. & S. Blockley; Old Storridge Common; Wolverton; Woodcote Green; Pensax; Offmoor; Upper Arley.—Var. *chrysophyllum* Bagnall. Beaucastle; Wyre Forest; lane to Upper Arley.—*B. velutinum* B. & S. Frequent.—*B. populeum* B. & S. Cowleigh Park, *Ley*; Old Storridge Common; Malvern Hills; Menith Wood, Pensax; Beoley; Frankley Hill; Wyre Forest; Habberley Valley; Selly Oak; Dudley Castle.—*B. plumosum* B. & S. Cowleigh, *Towndrow*; Old Storridge Common; Pound Green; Pensax; Gladders Brook; Wyre Forest; Offmoor Wood; Frankley.—Var. *homomallum* Bry. Eur. Old Storridge Common.—*B. cæspitosum* Dixon. Feckenham; Peopleton; Kempsey Common; near Shrawley; Stanford-on-Teme; Wyre Forest; Butlers Hill, *cft.*; Warshill Wood; Weston Park and Hadley, near Droitwich.—*B. iliecebrum* De Not. Harvington; Cleeve Hill; Malvern Wells; Malvern Link; Pensax; near Bewdley; Habberley Valley; Blakeshall Common.—*B. purum* Dixon. Common. In fruit, Broadway;

Martley; near Redditch; Stagsbury; Wyre Forest; Frankley; Clent Hills.

Hyocomium flagellare B. & S. Cleeve Mill, near Cleeve Prior.

Eurhynchium piliferum B. & S. Frequent; woods, &c.—*E. crassinervium* B. & S. Near St. Anne's Well, Malvern; Shrawley Wood.—*E. speciosum* B. & S. Rare. Canal side, near Alvechurch. —*E. prælongum* B. & S. Frequent. In fruit, Ockeridge Wood, near Hallow.—Var. *Stokesii* L. Cat. Cowleigh Park, *Towndrow*! Pensax; Wyre Forest; Seckley Wood; Arley Wood; Frankley Hill; World's End, near Harborne.—*E. Swartzii* Hobk. Common. —*E. abbreviatum* Schimp. Rare. Old Storridge Common.—*E. pumilum* Schimp. Peopleton, near Worcester; Rous Lench; Coles Green, near Worcester; Southstone Rock; Leigh Brook; Menith Wood, Pensax; Carpenter Hill Wood; Barnt Green.—*E. curvisetum* Husn. Rous Lench; Ribbesford Wood.—*E. Teesdalii* Schimp. Seckley Wood!, *Fraser*; Eastham, near Tenbury; Dick Brook; Gladders Brook, near Stourport; Upper Arley.—*E. tenellum* Milde. Western slopes of Malvern, *Lees*; Bredon Hill; Martley quarries; Southstone Rock; Eastham; Wyre Forest; Trimpley Green; Seckley Wood.—*E. myosuroides* Schimp. Tundridge; Alfrick; Offmoor; Halesowen; Seckley, &c.—Var. *rivulare* Holt. Ockeridge Wood, near Hallow; Wyre Forest, on wet rocks; Seckley Wood, stones in streams.—*E. striatum* B. & S. Frequent. Woods, and on hedge-banks, &c.—*E. ruscifolme* Milde. Frequent. Streams, &c.—Var. *inundatum* Brid. Stream, Frankley Hill.—*E. murale* Milde. Blockley; Broadway; Bredon; Tundridge; Alfrick; Eastham, &c.—Var. *julaceum* Schimp. Wall, Bockleton, near Tenbury. —*E. confertum* Milde. Malvern Link, *Towndrow*! Besford; Woodcote Green; Alvechurch; Bewdley, &c.—*E. megapolitanum* Bland. Dowles Brook, Bewdley; Upper Arley; Frankley Hill.

Plagiothecium depressum Dixon. Stonework of drain near Shatterford.—*P. Borrerianum* Schimp. Malvern; Hanley Dingle, Stanford-on-Teme; Shrawley Wood; Lickey Hill; North Wood, Bewdley; Wyre Forest; Arley Wood; Frankley.—*P. denticulatus* B. & S. Frequent.—*β aptychus* L. Cat. Cowleigh; Pensax; Bewdley; Seckley Wood; Beoley; Frankley.—*γ majus* Boul. Trench Wood; Highter Heath, near Kings Norton; quarry, Halesowen.—*P. sylvaticum* B. & S. Shortwood Coppice, near Alvechurch; Pensax Wood; North Wood, Bewdley; Seckley Wood.—*P. undulatum* B. & S. Near Ombersley; Lickey Hill; Romsley Hill; Seckley Wood; Arley Wood.—*P. latebricola* B. & S. Near Ombersley; Burcott Pool, near Kidderminster; Twylands Wood, Frankley; Offmoor Wood, Clent.

Amblystegium serpens B. & S. Common.—*A. Juratzkanum* Schimp. Alfrick; Coles Green, near Worcester; Barnt Green. This seems to be intermediate between *A. serpens* and *A. varium*, being more robust than *A. serpens*, and having large spores as in *A. varium*.—*A. varium* Lindb. Stone Bowbridge, Peopleton; near Bromsgrove; near Alvechurch; Stanklin Pool, near Kidderminster; Wythall Heath and West Heath, near Kings Norton.—*A. irriguum* B. & S. Peopleton; Leigh Sinton; Coles Green, near Worcester; Knight-

wick; Southstone; Dick Brook; Pedmore; Alvechurch; Kidderminster; Kings Norton; Twylands Wood, Frankley.—*A. fluviatile* B. & S. Stream near Bewdley; stream in Seckley Wood.—*A. filicinum* De Not. Old Storridge!, *Toundrow*; Longdon Marsh; Castle Morton; Tardebig Canal, *cft.*; Lickey Hill; Hopwood Dingle, *cft.*; Frankley Hill; Bewdley, &c.—*β Vallisclausæ* Dixon. Great Cowleigh; Southstone Rock; canal side, Hopwood; Wyre Forest; near Rubery.—*γ gracilescens* Schimp. Frankley Hill.

Hypnum riparium L. Pershore; Stanford Bridge; Tardebig; Frankley Hill; Wyre Forest, &c.—*β longifolium* Schimp. Stanford Bridge; Goose Hill Green, near Hanbury; Holt Fleet.—*γ splendens* De Not. Knightwick; Pitts Wood, near Harborne; River Severn, near Upper Arley.—*H. polygamum* Schimp. Stanklin Pool, near Kidderminster.—*H. stellatum* Schreb. Defford; Castle Morton Common; Old Storridge Common; Wyre Forest; near Arley; Frankley Hill; Offmoor Wood, near Clent.—*β protensum* B. & S. Old Storridge Common; Suckley; Trench Wood; Twylands Wood; Frankley; Offmoor Wood; Wyre Forest, *cft.*—*H. chrysophyllum* Brid. Bredon Hill; Ravens Hill; Alfrick; Blackstone Hill; Ockeridge Wood, near Hallow; Eastham; Menith Wood, Pensax; Wyre Forest; Frankley Hill; Carpenter Hill Wood.—*H. Sommerfeltii* Myrin. Limestone rocks, Broadway.—*H. aduncum* Hedw. Wyre Forest; Billesley Common, Moseley.—(Group *Kneiffii*) forma *laxifolia* Ren. Kyre Common, near Tenbury.—Var. *paternum*. Clay-pit, Armscote.—*H. Sendtneri* Schimp. Newbold-on-Avon; St. Kenelms.—*H. uncinatum* Hedw. Malvern, *Lees*; Moseley, *Webb*! near Dowles Brook, Wyre Forest, 1890.—*H. fluitans* L. Knightwich; Alvechurch; Bittel Reservoir; Wyre Forest.—Var. *Jeanbernati* Ren. Dowles Brook; Wyre Forest.—Forma *tenella* Ren. Dowles Brook; Wyre Forest.—*H. exannulatum* Guemb. Dowles Brook; Wyre Forest; stream by Twylands Wood, Frankley.—Var. *pinnatum* Boul. Near Shelsey Beauchamp.—Var. *falcifolium* Ren. Stream by Twylands Wood, Frankley.—*H. vernicosum* Lindb. Dowles Brook; Wyre Forest.—*H. revolvens* Swartz. Seckley Wood, near Bewdley.—Var. *Cossoni* Ren. Beaucastle, Wyre Forest.—Var. *intermedium* (Lind.) Ren. Wyre Forest; Hartlebury Common.—*H. commutatum* Hedw. Blockley; Old Storridge Common; Martley; Stanford-on-Teme; Wyre Forest; Seckley Wood, near Bewdley; Hopwood Dingle; Frankley Hill.—*H. falcatum* Brid. Castle Morton Common; Wyre Forest; Hopwood Dingle.—*β gracilescens* Schimp. Stanford-on-Teme; Wyre Forest.—*γ virescens* Schimp. Blockley; Martley; Southstone; stream in Wyre Forest.—*H. cupressiforme* L. Common.—*β resupinatum* Schimp. Tewkesbury; Defford; walls, Croome Park; Ribbesford; Wyre Forest; Seckley Wood, near Bewdley.—*γ filiforme* Brid. Bredon Hill; Croome Park; Wittington; Pensax; Wyre Forest; Seckley Wood.—Var. *minus* Wils. Shrawley Wood.—*ζ ericetorum* B. & S. Kempsey Common; Ravens Hill; Lickey Hill; Randan Woods; Pepper Wood; Pensax Wood; Ribbesford Wood; North Wood, Bewdley; Habberley Valley.—*η tectorum* Brid. Bredon Hill; Kempsey Common; Old Storridge Common; Trench

Wood; Abberley Hills; Offmoor Wood, Clent, *cft.*; Pitcher Oak Wood.—θ *elatum* B. & S. Kempsey Common; Pensax Wood.—*H. Patientia* Lindb. Near Pershore; Alfrick; Trench Wood; Alvechurch; Shrawley Wood; Abberley Hill; Ribbesford Wood; North Wood; Seckley; Habberley Valley; Hagley Wood; Frankley, &c.—*H. molluscum* Hedw. Frequent on limestone, marl, and clay.—Var. *erectum* Bagnall. Crows Hill, Alfrick. — *H. palustre* L. Stream, Pensax; Wyre Forest; Seckley Wood; Twylands Wood; Frankley; Offmoor Wood; Bell End; Iley Mill, near Halesowen.—β *hamulosum* B. & S. In stream, Old Storridge Common; stream, Pensax; Dowles Brook, Wyre Forest; Twylands Wood; Frankley.—γ *subsphærocarpon* B. & S. Stream, North Wood, Bewdley.—*H. scorpioides* L. Feckenham Bog, *Purt.*; Moseley Bog, *Webb*! — *H. stramineum* Dicks. Bilberry Hill, Lickeys, 1870. — *H. cordifolium* Hedw. Stourport; Stanklin Pool, near Kidderminster; California. —*H. giganteum* Schimp. Stanklin Pool, near Kidderminster; railway-cutting, Acocks Green, 1871.—*H. cuspidatum* L. Frequent. —*H. Schreberi* Willd. Frequent. Wyre Forest, in fruit, *Webb*!

Hylocomium splendens B. & S. Frequent.—*H. brevirostre* B. & S. Malvern Hill, *Lees*; Trench Wood; Wyre Forest.—*H. loreum* B. & S. Worcester Beacon; Cowleigh Park!, *Lees*; Monk Wood, Worcester, *Thompson*; Pensax Dingle; Ribbesford Wood; Gladders Brook; Wyre Forest; Eyemore Wood; Coldridge Wood.—*H. squarrosum* B. & S. Frequent.—β *calvescens* (Hobk.). Old Storridge Common; Ockeridge Wood; Wribbenhall; Shatterford; Offmoor Wood.—*H. triquetrum* B. & S. Frequent. Ankerdine and Clent, **in fruit; Wyre Forest, in fruit.**

Hepaticæ.

Frullania Tamarisci L. Worcestershire Beacon; Wyre Forest; Seckley; St. Kenelms, &c.—*F. dilatata* L. Hanley Dingle; Dunley; Pensax; Wyre Forest; Seckley; Wythall Heath, &c.

Lejeunia serpyllifolia Dicks. Shelsey Walsh; Hanley Dingle, Teme Valley; Gladders Brook; North Wood; Dowles Brook, Wyre Forest; Seckley Wood.— *L. patens* Lindb. Hanley Dingle, Teme Valley.

Radula complanata L. Piddle Brook, Radford; Dingle Eardistone; Shrawley Wood; Hartlebury Common; Wyre Forest; Seckley Wood; Wythall Heath.

Porella platyphylla L. Southstone Rock; Wyre Forest; Seckley Wood, &c.

Blephorozia ciliaris L. Malvern Hills; heathy footways near Kings Heath; Blakeshall Common.

Trichocolea tomentilla Ehrh. High Grove Hill and the Gullet; Malvern Hill, *Lees*; Dowles Brook, Wyre Forest; Seckley Wood.

Blepharostoma trichophyllum Dill. Seckley Wood.

Lepidozia reptans L. Trench Wood; Shrawley Wood; Dunley; Ribbesford Wood; near Kidderminster; Wyre Forest; Seckley Wood; Arley Wood.

Bazzania triangularis Schleich. Dowles Brook, Wyre Forest.

Kantia trichomanis L. Shelsey Walsh; Lickey Hill; Pensax;

Hartlebury Common, &c.—*K. arguta* Mart. Rhyd Covert, near Bewdley; Habberley Valley; Seckley Wood; Arley Wood; Twylands Wood, Frankley; Offmoor Wood; Hagley Wood.

Cephalozia lunulæfolia Dum. Lickey Hill; Wythall Heath; Seckley Wood; Arley Wood.—*C. bicuspidata* L. Frequent.—*C. connivens* Dicks. Malvern, *Lees*; Lickey Hill; Wythall Heath.—*C. divaricata* Sm. Old Storridge Common; Ravens Hill; Trench Wood; Pensax; Gladders Brook, Bewdley; North Wood; Rhyd Covert; Habberley Valley; Offmoor Wood; Bell Heath.

Scapania compacta Lindb. Old Storridge Common; rocks near Kidderminster.—*S. resupinata* Dill. Offmoor Wood, Clent; Coston Hacket; Blakeshall Common.—*S. aspersa* Müll. & Bern. Shrawley Wood; Dowles Brook, Wyre Forest; Blakeshall Common.—*S. nemorosa* L. Old Storridge Common; Trench Wood; Lickey Hills; Offmoor Wood; Shrawley Wood; Wyre Forest; Seckley Wood; Blakeshall Common; Arley Wood; Hagley Wood; Offmoor Wood, Clent.—*S. undulata* L. Lickey Hills; Seven Hills, near Bewdley; Dowles Brook, Wyre Forest; Seckley Wood; West Heath.—*S. irrigua* Nees. Old Storridge Common; Lickey Hills; Seven Hills, near Bewdley; Seckley Wood; Arley Wood; Wythall Heath; Hagley Wood.—*S. curta* Mart. Old Storridge Common; Trench Wood; Rhyd Covert, near Bewdley; North Wood; Wyre Forest; Seckley Wood; Bell Heath.—*S. convexa* Scop. Coston Hacket.

Diplophyllum albicans L. Lickey Hills; Shrawley Wood; North Wood; Wyre Forest; Hartlebury Common; Blakeshall Common; Bell Heath, &c.

Lophocolea bidentata L. Trench Wood; Lickey Hills; Twylands Wood, Frankley; Shrawley Wood; Wyre Forest; Seckley Wood, &c.—*L. cuspidata* Limp. Coles Green, near Worcester; Shrawley Wood; Wyre Forest; Seckley. Showing male and female flowers. —*L. heterophylla* Schrad. Stockton-on-Teme; Wyre Forest; Seckley Wood; Wythall Heath, &c.

Chiloscyphus polyanthos L. High Grove Hill, *Lees*; Old Storridge Common; Lickey Hills; North Wood; Wyre Forest; Seckley Wood; Frankley Hill; Wythall Heath.—*b. rivularis* Nees. Stream, Frankley Hill.

Plagiochila asplenioides L. Old Storridge Common; Lickey Hill; Shrawley Wood; Wyre Forest; Seckley Wood; Arley Wood, &c.—*c. minor* Carr & Pear. Seckley Wood.—*P. spinulosa* Dicks. Gladders Brook, near Bewdley; sandstone rocks, Upper Arley.

Jungermania cordifolia Hook. River Severn, near Seckley.—*J. pumila* With. Ribbesford Wood; Arley Wood.—*J. riparia* Tayl. On boulders in the River Severn, near Seckley; Twylands Wood, Frankley; stream near Hagley; Dowles Brook, Wyre Forest; stream in dingle near Upper Arley.—*J. inflata* Huds. Old Storridge Common; Lickey Hills; Dowles Brook, Wyre Forest; Hartlebury Common; Upper Arley; Blakeshall Common; Wythall Heath; Hagley Wood.—*J. turbinata* Raddi. Cleeve Prior; Trench Wood; Stockton-on-Teme; Pensax; Twylands Wood, Frankley; abundant, Upper Arley, with colesules; Hagley Wood; Offmoor.—*J. sphærocarpa* L. Old Storridge Common; near Newbold; Lickey

Hill; Shrawley Wood; by Dowles Brook, Wyre Forest; Seckley Wood; Arley Wood; Offmoor Wood; Bell End; Hagley; the Heath, Bewdley, &c.—*J. barbata* Schmidt. Rocks near Churchill.—*J. gracilis* Schleich. Seven Hills, near Bewdley; Habberley Valley. —*J. incisa* Schrad. Wyre Forest.— *J. capitata* Hook. Ravenshill Wood, Suckley; Blakeshall Common. — *J. bicrenata* Schmidt. Blakeshall Common; Warshill. — *J. ventricosa* Dicks. Malvern Hills; Old Storridge Common; Lickey Hills; Wyre Forest; Seckley Wood; Wythall Heath; Blakeshall Common.—*J. crenulata* Sm. Newbold; Trench Wood; Ockeridge Wood; Lickey Hill; Offmoor Wood; Hagley Wood; Arley Wood; Blakeshall Common; Wythall Heath.—*J. gracillima* Sm. Old Storridge Common; Lickey Hill; Shrawley Wood; Hartlebury Common; Hagley Wood; Seckley Wood; Arley Wood; Wythall Heath.—*J. scalaris* Schrad. Butlers Hill, Newbold; Old Storridge Common, &c. Frequent.

Saccogyna viticulosa Mich. Twylands Wood, near Frankley; Gladders Brook, Bewdley; Seckley Wood.

Fossombronia cæspitiformis De Not. Damp banks, Dowles Brook, Wyre Forest; Offmoor Wood. — *F. pusilla* L. Shrawley Wood!, *Lees*; river-banks, Seckley; Blakeshall Common, on sandstone rocks. —*F. cristata* Lindb. Trench Wood; Ockeridge Wood.

Pellia epiphylla L. Shrawley Wood!, *Lees*; Teme Valley!, *Lees*; Old Storridge Common; Wyre Forest; Seckley Wood, &c. — *P. calycina* Tayl. Cleeve Prior; Shrawley Wood; Offmoor Wood; Seckley Wood; Arley Wood; near Wolverley and Blakeshall; Chaddesley Wood; Frankley Hill.

Aneura multifida L. Valley of the Teme!, *Lees*; Malvern Hill; Twylands Wood, Frankley; Offmoor; Chatley Green.—*A. sinuata* Dicks. Seckley Wood.—*A. pinguis* L. Valley of the Teme!, *Lees*; Malvern Hill; Lickey Hill; Gannow Green; Seckley Wood; Frankley Hill; Hagley Wood.

Metzgeria hamata Lindb. Shelsey Walsh, Teme Valley. — *M. furcata* L. Malvern Hills; Shelsey Walsh; North Wood; Seckley Wood; Offmoor Wood; Blakeshall Common, &c.

Marchantia polymorpha L. Malvern!, *Lees*; Old Storridge Common; Lickey Hill; Wyre Forest; Seckley Wood, &c.

Reboulia hemisphærica (L.). Malvern!, Cookley Wood, *Lees*; Shrawley Wood.

Conocephalus conicus L. Frequent.

Lunularia cruciata L. Frequent; always barren.

Targionia hypophylla L. Malvern Hill; moist sandstone rocks, Habberley!, *Lees*; Habberley Valley.

Riccia glauca L. Near Lickey Hill; Shrawley; Clent; near Churchill; Dick Brook, near Droitwich.

Anthoceros punctatus L. Near Wannerton Downs, Malvern; near Churchill; near Wolverley.

ALABASTRA DIVERSA.—Part XI.

By Spencer le M. Moore, B.Sc., F.L.S.

(Continued from p. 313.)

Dr. Rand's Transvaal Plants* (continued).

Rubiaceæ.

Oldenlandia herbacea Roxb. Nos. 1130, 1160.
O. amatymbica K. Schum. No. 730.
Pentanisia variabilis Harv. No. 729.
Canthium Mundtianum Cham. & Schlecht. No. 882.
C. Chamædendron (*Plectronia Chamædendron* O. Kuntze). No. 1020.

Canthium transvaalense, sp. nov. Suffruticosum, humile, glabrum, caulibus subteretibus deorsum efoliatis, ramulis aliquantulum complanatis foliosis, foliis lineari-oblanceolatis apice mucronulatis inferne in petiolum brevem gradatim desinentibus firme membranaceis, stipulis subulatis basi maxime ampliatis diu persistentibus, cymis paullulum extra-axillaribus plurifloris quam folia brevioribus, floribus 5–6-meris pedicellis calycem excedentibus insidentibus, calycis lobis abbreviatis ovatis vel ovato-oblongis obtusis acutisve nonnunquam obtusissimis, corollæ ultra medium in lobos lineari-lanceolatos sursum unguiculato-acuminatos partitæ tubo infundibulari intus ad medium annulo pilorum longorum pendulorum onusto, staminibus sub sinubus corollæ affixis antheris basi obtusis apice apiculatis breviter exsertis, ovario subhemisphærico glabro, stigmate ovoideo, drupa———

Hab. Johannesburg, Bezuidenhout's valley, southern flank. No. 732.

Foliorum lamina 4·0–5·0 cm. long., 1·0–1·2 cm. lat., læte viridis; costa centralis supra plana, subtus prominens; nervulæ semitranslucentes, eleganter reticulatæ, supra parum eminentes, subtus planæ impressæve; petioli ± 0·5 cm. long. Stipulæ 0·3–0·5 cm. long. Cymæ adusque 2·5 cm. long. Pedunculus complanatus, 1·0 cm. long.; pedicelli circa 0·3 cm. long. Calycis tubi pars libera brevissima; lobi 0·1–0·15 cm. long. Corolla in toto 1·3 cm. long.; tubus 0·5 cm. long.; lobi 0·8 cm. long., summum 0·12 cm. lat., extus sensim leviter puberuli, intus eminenter 3-nervosi. Antheræ 0·13 cm. long. Ovarium vix 0·2 cm. diam. Stylus 0·7 cm. long.; stigma 0·06 cm. diam.

Dr. Rand notes of this: "Small tufted shrublet. Forms bright green patches close to the ground. Flowers green with yellowish tinge."

Closely allied to *C. abbreviatum* (*Plectronia abbreviata* K. Schum.), but different from it in the small leaves, the relatively shorter and broader calyx-lobes, the longer corolla divided nearly two-thirds of

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* Unless otherwise stated, the localities are Johannesburg and the immediate neighbourhood. The *Convolvulaceæ* were named by Dr. Rendle, and my friends at Kew have kindly given me an opinion here and there.

the way down, the anthers obtuse at base instead of sagittate, the longer slenderer style, and the small ovoid stigma.

Vangueria infausta Burch. No. 731.
Anthospermum hispidulum E. Mey. Nos. 1265, 1266.
Galium rotundifolium L. No. 1161.
G. rotundifolium L. var. *hirsutum* Harv. Greylingstad. No. 1310.
G. capense Thunb. No. 974.

COMPOSITÆ.—II. (continued from p. 136).

Vernonia stahelinoides Harv. Heidelberg. No. 1255.
V. monocephala Harv. No. 1028.
Garuleum Woodii Schinz. Greylingstad. No. 1316.
Diplopappus filifolius DC. Greylingstad. No. 1317.
Nidorella depauperata Harv. No. 1296.

Helichrysum (LEPICLINE § PLANTAGINEA) **campaneum**, sp. nov. Herbaceum caulibus a basi simplicibus erectis gracilibus lana araneosa alba arcte circumdatis omnimodo foliosis, foliis radicalibus parvis oblongo-ovatis obtusis obscure trinervibus membranaceis supra appresse villosis subtus densissime albo-tomentosis, foliis caulinis anguste lineari-oblongis apicem versus gradatim attenuatis sessilibus uninervibus maxima pro parte caulem laxiuscule amplectantibus utrinque araneosis, capitulis parvis late turbinatis circa 30-flosculosis brevissime pedunculatis ad apicem caulis dense aggregatis, floseulis omnibus hermaphroditis, involucri circa 6-serialis basi lanati phyllis anguste obovato-oblongis intimis oblongis dilute luteis lamina ovata obtusa vel obtusissima concolori haud radiante onustis, receptaculi paleis lineari-setaceis, achæniis anguste ovoideis teretibus glabris, pappi setis scabridis præterquam ad extremum ubi barbellatis.

Hab. Johannesburg, open veldt near Roodepoort to westward. No. 1301.

Planta fere ½-metralis. Folia radicalia 1·5 cm. long., 0·5–0·8 cm. lat.; caulina vetustiora 2·0 cm. long., juniora 1·5 cm., summum 0·2–0·25 cm. lat. Capitulorum glomeruli fere 2·0 cm. diam. Pedunculi 0·2 cm. long., dense araneosi, bracteis paucis scariosis circa 0·4 cm. long. ipso sub capitulo onusti. Capitula 0·6 cm. long., vix 0·5 cm. diam. Involucri phylla 0·4 cm. long. Receptaculi paleæ fere 0·1 cm. alt. Corollæ tubus 0·25 cm. long., 0·04 cm. lat.; lobi extus glandulosi. Achænia 0·06 cm., pappus 0·3 cm. long.

To be inserted in the genus next to *H. cephaloideum* DC., from which it can be told on sight by reason of its broader and shorter radical leaves, and its smaller, differently shaped, fewer-flowered, pale-coloured heads.

H. cymosum Less. Greylingstad. No. 1318.
H. callicomum Harv. No. 1278.

Helichrysum (LEPICLINE § APTERA) **lepidissimum**, sp. nov. Suffrutex ramosissimus necnon foliosus, ramulis ascendenti-patulis una cum foliorum pag. inf. dense albo-araneoso-tomentosis, foliis parvis obovatis obtusissimis vel sæpius breviter apiculatis crenulatis vel saltem undulatis in petiolum latiusculum basi amplificatum

desinentibus supra pilis articulatis albis appressis glandulisque minimis lucentibus munitis ibique in sicco læte virentibus, capitulis parvis sessilibus oblongo-cylindricis homogamis 13–15-flosculosis in glomerulis parvis pluricapitulatis ramulos coronantibus dispositis, involucri argyracei nitentis circa 6-serialis phyllis erectis ovatis obtuse acutis extimis quam intermedia paullo brevioribus intimis parum angustioribus et longioribus, receptaculi setis lanceolatis ovaria excedentibus, flosculis omnibus hermaphroditis, achæniis hucusque valde crudis cylindricis glabris, pappi setis scabriusculis albis.

Hab. Johannesburg, among sandstone rocks to northward. No. 1294. (Also, at Kew, Transvaal; *Thorncroft*, Herb. Wood. No. 4352.)

Foliorum majorum lamina adusque 2·0 cm. long., et 1·2 cm. lat., petiolo 0·7 cm. long. fulta; folia modica 1·0–1·5 cm. long., petiolo 0·4 cm. long. haud exempto. Capitulorum glomeruli 1·5–2·5 cm. diam. Capitula pansa 0·5 cm. long., 0·3 cm. diam. Involucri phylla extima 0·3 cm., interiora 0·4 cm., intima 0·42 cm. long. Receptaculi setæ fere 0·1 cm. long. Corollæ 0·3 cm. long., deorsum virides sursum croceæ; limbus 5-lobus. Antherarum caudæ simplices. Achænia immatura 0·06 cm., pappi setæ 0·4 cm. long.

A most charming little species, the green upper side of its leaves harmonizing well with the clusters of sflvery white capitula and the saffron florets. It seems nearest to *H. auriculatum* Less., but in foliage, flower-heads, &c., is abundantly distinct.

The specimen at Kew is a small scrap which has lost almost all its beauty apparently from the action of the corrosive sublimate used to preserve it.

Geigeria intermedia S. Moore. No. 1139.
Schistostephium heptalobum Benth. & Hook. fil. No. 1137.
Cineraria albescens N. E. Br. No. 1279.

Cineraria longipes, sp. nov.—Herbacea, ascendens, glaber, caule folioso manifeste angulato longitrorsum striato, foliis parvis reniformi-cordatis reniformibusve (additis raro lobis 2 basalibus oblongis dentatis) margine impariter dentato-crenatis palmatinervibus paullulum crassiusculis petiolis quam se ipsa multo longioribus basi auriculatis suffultis, capitulis ad normam generis magnis brevipedunculatis heterogamis radiatis pluriflosculosis in corymbo paucicephalo digestis, pedunculis propriis involucra longe excedentibus crebro bracteatis bracteis in calyculi phylla transeuntibus superioribus subimbricatis, involucri late campanulati phyllis 13 inter se inæquilatis oblongis acutis vel acuminatis marginibus anguste vel latius scariosis trinervibus sursum rubescentibus, ligulis 13 ex involucro eminentibus lineari-oblongis evanide 3-dentatis flavis, achæniis adhuc valde crudis maxime compressis angustissime alatis (an semper ?) glabris, pappi setis achænia excedentibus scabriusculis albis.

Hab. Johannesburg, upon Klipriviersberg to southward. No. 1298.

Specimen unicum a me scrutatum fere 30·0 cm. alt. Foliorum lamina modice circa 1·0 cm. long. et 1·5 cm. lat.; lobi basales si

adsint modo 0·3–0·5 cm. long.; petioli adusque 4·0 cm. long., horum auriculæ quæ nonnunquam desunt oblongæ, 0·15 cm. long. Pedunculus circa 2·0 cm., pedunculi proprii 2·5–3·0 cm. long., horum bracteæ subulatæ, inferiores 0·5 cm. long. vel etiam paullo longiores, superiores ut calyculi phylla pauca 0·3 cm. long. Involucra 0·7 cm. long., 1·0 cm. lat.; phylla 0·13–0·17 cm. lat. Ligulæ (lamina) 0·7 cm. long., 0·2 cm. lat., 4-nervosæ. Disci corollæ 0·4 cm. long. Achænia 0·15 cm. long., 0·05 cm. lat.; pappus 0·4 cm. long.

A near ally of the plant known since the time of Linn. fil. Suppl. as *Senecio cordifolius* Linn. fil., but certainly different from it by reason of the reniform leaves on much longer petioles, the short peduncles, the densely bracteate proper peduncles, shorter ligules, &c.

Senecio Johannesburgensis, sp. nov.— Herbaceus, minute glanduloso-pubescens, caulibus e radice verisimiliter annua paucis ascendentibus omnimodo foliosis, foliis radicalibus longipetiolatis circuitu oblongis obtusis sublyrato-pinnatifidis jugis utrobique 3–4 late oblongis raridentatis parte terminali lobulata lobulis dentatis denticulatisve, foliis caulinis radicalibus similibus nisi minoribus et summum breviter lobulatis nec pinnatifidis summis lineari-oblongis solummodo dentatis vel linearibus et integris, petiolis basin versus aliquantulum dilatatis haud auriculatis, capitulis heterogamis radiatis multifloseulosis in corymbo laxo paucicephalo digestis, pedunculis propriis elongatis bracteas 1–2 linearibus munitis, calyculi phyllis perpaucis (circa 2) subulatis, involucri turbinati glandulosi phyllis 15 anguste linearibus acuminatis apice ipsa sphacelatis 2-lineatis, ligulis 8 ex involucro eminentibus obovato-oblongis luteis, disci flosculis circa 40 paullulum exsertis, styli ramis truncatis penicillatis, achæniis crudis linearibus sursum lævissime angustatis compressiusculis obscure costatis puberulis, pappi setis albis glabris.

Hab. Johannesburg, Klipriviersberg to southward. No. 1135.

Planta 30·0 cm. alt. Folia radicalia (lamina) 5·0–6·0 cm. long., 1·3–1·5 cm. lat.; lobi ± 0·5 cm. long. et lat.; petioli 3·0–3·5 cm. long. Folia caulina in toto 3·5–5·0 cm. long., 0·4–0·7 cm. lat. (accedunt perpauca summa anguste linearia 0·1 cm. lat. vel etiam minus). Pedunculi proprii 5·0–6·5 cm. long.; horum bracteæ 0·3–0·7 cm. long. Involucrum 0·7 cm. long., 0·5 cm. lat.; phylla circa 0·05 cm. lat. Ligulæ (lamina) 0·5 cm. long., 4-nervosæ, apice minute 3-dentatæ. Disci flosculi 0·62 cm. long. Achænia 0·25 cm. long., 0·05 cm. lat. Pappus 0·7 cm. long.

Differs from *S. consanguineus* DC., among other points, in the lobing of the glandular-pubescent exauriculate leaves, the long proper peduncles, different number of involucral leaves and ligules, and much greater number of florets of the disc.

S. serratuloides DC. var. *gracilis* Harv. No. 1295.

S. pentactinus Klatt. No. 1140.

S. achilleæfolius DC. var. **brevilobus**, var. nov. Foliorum lobi adusque 0·2 cm. long. extenuati. No. 1299.

Crocodilodes speciosum O. Kuntze (*Stobæa speciosa* DC.). No. 1138.

Haplocarpha scaposa Harv. No. 1139.

Dicoma anomala Sond. var. *microcephala* Harv. Nos. 1259, 1260.

[Correction.—"*Dimorphotheca Barberiæ* Harv." on p. 135 should be altered to "*D. spectabilis* Schlechter." For some time I had doubts about this determination, and when Mr. Schlechter was over here in the summer, I took the opportunity of asking his opinion. He unhesitatingly confirmed my correction of the name as given above.]

Campanulaceæ.

Mezleria depressa Sond. No. 1321.
Lobelia decipiens Sond. No. 733.

Lobelia rosulata, sp. nov. Herbacea, annua, caule erecto simplici subscaposo tenero deorsum pubescente vel puberulo sursum glabro fere efoliato, foliis maxima pro parte ad basin caulis confertis late ovatis vel oblongo-obovatis obtuse acutis vel obtusis vel etiam obtusissimis margine undulatis vel undulato-dentatis basi obtusis vel acutis membranaceis glabris vel una cum petiolo sat longo piloso-puberulis, foliis perpaucis caulinis nonnunquam mancis ut bracteæ anguste linearibus, racemis plurifloris folia longe excedentibus una cum pedicellis floribusque glabris, pedicellis gracilibus flores æquantibus, calycis tubo late turbinato vel hemisphærico lobis lineari-setaceis æquilongo, floribus cæruleis loborum inf. basi dilutissime lutea exempta, corollæ tubo quam calycis lobi breviore, lobis superioribus spathulato-oblongis quam inferiores oblongo-obovatos altius connatos brevioribus, antheris 2 apice penicillatis reliquis dorso sub apice hispidulis, ovario omnino infero.

Hab. Damp ground in the neighbourhood of Johannesburg. Nos. 734, 865.

Planta 8·0–12·0 cm. alt. Foliorum lamina 0·5–0·7 cm. long., 0·25–0·5 cm. lat.; petioli 0·3–0·8 cm. long. Folia caulina 0·3–0·7 cm. long. Bracteæ ± 0·2 cm.; pedicelli adusque 1·0 cm. long. Calycis tubus et lobi sub flore 0·2–0·25 cm. long. Corolla in toto 1·0–1·2 cm. long.; tubus 0·12 cm., lobi superiores 0·4 cm., inferiores 0·5 cm. long.; hi 0·25 cm. lat. Staminum tubus 0·3 cm., antheræ 0·1 cm. long. Capsula ignota.

There are two forms of this; no. 865 has broader radical leaves and turbinate instead of hemispherical ovaries, but I see no essential difference in the two cases.

The species is easily recognized by means of the small rosulate leaves. In this respect—and, indeed, in habit generally—it resembles *L. benguellensis* Hiern, which has much smaller flowers, with short and relatively broader calyx-lobes, a different limb to the corolla, anthers all glabrous on the back, &c.

Cyphia stenopetala Diels. No. 1254.
Lightfootia paniculata Sond. No. 1293.
Cervicina denudata (*Wahlenbergia denudata* A. DC.). No. 866.
C. depressa (*Wahlenbergia depressa* Wood & Evans). No. 1253.

Myrsineæ.

Myrsine africana Linn. Greylingstad. Nos. 1322, 1323.

Sapotaceæ.

Sideroxylon Randii, sp. nov. Fruticosum, ramulis subteretibus abunde foliosis primo rufo-tomentosis dein breviter pube-

scentibus, foliis brevipetiolatis oblongo-oblanceolatis nunc obtusis nunc paullulum retusis raro nigro-apiculatis supra molliter griseo-pubescentibus cito glabris et pallide viridibus subtus rufo-tomentosis coriaceis costa centrali supra leviter impressa subtus maxime eminente, costis secundariis pag. sup. fere evanidis pag. inf. utrinque circa 30 rectis inter se parallelis interjectis costis numerosioribus tertii ordinis minus perspicuis, petiolis validis supra canaliculatis breviter pubescentibus, stipulis lineari-subulatis sepius curvatis pubescentibus diu persistentibus, floribus ad nodos foliatos solitariis vel perpaucis, pedunculis flores excedentibus rufo-tomentosis, calycis lobis 5 inter se liberis late ovatis obtusis extus rufo-tomentosis intus minute griseo-pubescentibus, corollæ lobis 5 ovatis quam tubus paullo longioribus, staminibus subinclusis loborum basubus imis insertis, antheris quam filamenta longioribus sursum coartatis apice mucronulatis lateraliter dehiscentibus, staminodiis sub sinubus corollæ affixis late ovatis quam stamina multo brevioribus, ovario ovoideo 4-loculo dense rufo-villoso, stylo ovario paullo breviore, stigmate simplici, bacca———

Hab. Johannesburg, northern escarpment of Witwatersrand series. No. 1017.

Folia 4·0–7·0 cm. long., 1·5–2·5 cm. lat.; petioli ± 0·5 cm., stipulæ 0·3–0·4 cm., pedunculi solemniter 0·7 cm. long. Flores pansi vix 0·5 cm. diam. Calycis lobi 0·3 cm., corollæ tubus 0·17 cm., lobi 0·3 cm., filamenta solemniter 0·1 cm., antheræ 0·2 cm., staminodia nec ultra 0·08 cm., ovarium 0·2 cm., stylus 0·15 cm. long.

This can be recognized at once by its rusty tomentum and persistent stipules.

The staminodes are frequently absent from the opened flowers, having apparently been gnawed away by insects.

Ebenaceæ.

Royena pallens Thunb. No. 708.
R. microphylla Burch. No. 884.
R. lucida Linn. Greylingstad. No. 1325.
Euclea lanceolata E. Mey. No. 1107.

Oleaceæ.

Menodora africana Hook. No. 867.

Apocynaceæ.

Pacouria capensis (*Landolphia capensis* Oliv.). No. 707.
Carandas Arduina (*Carissa Arduina* Lam.). No. 883.
Acokanthera venenata G. Don. No. 709.

Loganiaceæ.

Nuxia dentata R. Br. var. **transvaalensis**, var. nov. A typo discrepat ob folia insigniter breviora, nempe 1·5–2·5 cm. long., marginibus modice integris sed nonnunquam raridenticulatis.

Hab. Johannesburg. No. 1132.

Nuxia breviflora, sp. nov, Fruticosa ramulis crebro foliosis primo pallide fulvo-tomentosis deinde glabris et cinereis et longi-

trorsum rimosis, foliis parvulis brevipetiolatis ternis obovatis vel obovato-oblongis nunc retusis nunc obtusis nunc revera obtusissimis basi obtusis integris vel parte superiori raridenticulatis coriaceis faciebus ambabus crispe ac dense stellato-pubescentibus costis secundariis utrobique 5–6 marginem versus arcuatim conjunctis una cum costis tertii ordinis aperte reticulatis parum perspicuis, corymbis plurifloris subdensis folia haud vel paullo excedentibus, pedunculis pedicellisque tomentosis his quam flores manifeste brevioribus, bracteis anguste linearibus tomentosis, floribus parvulis, calycis campanulati fere usque ad medium partiti tomentosi intus pilis sericeis appressis onusti lobis deltoideis obtusis, corollæ lobis oblongo-ovatis obtusis dorso puberulis, antheris longe exsertis horum loculis confluentibus, ovario dense sericeo, stylo exserto obtuso, capsula———

Hab. Johannesburg, northern escarpment of Witwatersrand series. No. 712.

Folia modica 1·5–2·0 cm. long., 0·7–1·5 cm. lat. Corymbi 3·0 cm. diam. Pedicelli summum 0·2 cm. long. Bracteæ 0·3 cm. long. Calyx in toto 0·25 cm. long., vix totidem diam.; lobi circa 0·1 cm. long. Corollæ tubus intus annulo sericeo præditus, 0·2 cm., lobi 0·15 cm. long., 0·12 cm. lat.

Differs from *V. tomentosa* Sond. chiefly in its small leaves, short campanulate calyces, corolla about half the size, with a much less pronounced fringe of hairs at the mouth of the tube, and relatively broader lobes.

Buddleia salviæfolia Lam. No. 716.

GENTIANEÆ.

Sebæa Burchellii Gilg. No. 855.
S. sedoides Gilg. No. 1228.
Chironia humilis Gilg. No. 1051.
Parasia grandis Hiern. No. 1227.
Swertia stellarioides Ficalho. No. 1288.

BORAGINEÆ.

Ehretia hottentotica Burch. No. 713.
Cynoglossum enerve Turcz. No. 874.
C. micranthum Desf. No. 1129.
Lithospermum cinereum A. DC. No. 1113.

CONVOLVULACEÆ.

Ipomœa calystegioides E. Mey. No. 961.
I. crassipes Hook. No. 1118.
I. Ommanei Rendle. No. 960.
I. plantaginea Hallier. No. 1105.

SOLANACEÆ.

Solanum panduriforme Drège. No. 702.
S. capense Linn. fil. No. 1019.

SCROPHULARIACEÆ.*

Nemesia fœtens Vent. Nos. 721, 880.

* See pp. 197, 364, 365.

Diclis petiolaris Benth. No. 871.
Lyperia Burkeana Benth. Nos. 720, 868.
L. multifida Benth. No. 723.
Sphenandra viscosa Benth. No. 1243.
Manulea parviflora Benth. No. 876.
M. paniculata Benth. No. 1276.
Limosella aquatica Linn. var. *alismoides* Welw. No. 719.
Melasma scabrum Berg. No. 1246.
Buchnera dura Benth. No. 1236.
Striga hirsuta Benth. No. 1157.
S. Thunbergii Benth. No. 969.
S. elegans Benth. Nos. 1018, 1235.
S. orobanchioides Benth. Nos. 1289 and (Greylingstad) 1301.
Rhamphicarpa tubulosa Benth. No. 1234.
Cycnium adoense E. Mey. No. 879.
Sopubia cana Harv. No. 1043.
Bopusia scabra Presl. No. 718.

LENTIBULARIEÆ.

Utricularia sanguinea Welw. No. 727.

GESNERACEÆ.

Streptocarpus Vandeleurii Bak. fil. & S. Moore. Greylingstad. No. 1313.

PEDALINEÆ.

Ceratotheca Kraussiana Burch. Hatherley, near Pretoria. No. 1250.
Pretrea eriocarpa Decaisne. Hatherley. Nos. 1248, 1249.

ACANTHACEÆ.

Chætacanthus costatus Nees. No. 870.
Blepharis Steinbankiæ C. B. Clarke. No. 1159. Dr. Rand notes of this :—" Procumbent. Leaves dark purplish green, forming leaf-mosaics upon surface of ground."
Barleria obtusa Nees. Greylingstad. No. 1312.
B. macrostegia Nees. Hatherley, near Pretoria. No. 1245.
Crabbea hirsuta Harv. No. 1244. Greylingstad. No. 1330.
Justicia anagalloides T. And. No. 728.
J. Anselliana T. And. No. 869.
Hypoestes verticillaris R. Br.

SELAGINEÆ.

Hebenstreitia elongata Bolus. No. 715.
Selago aggregata Rolfe. Heidelberg. No. 1241.
S. capitellata Schlechter. No. 1242.
Walafrida paniculata Rolfe. No. 872.

VERBENACEÆ.

Lantana salvifolia Jacq. No. 714.
Lippia scaberrima Sond. No. 1290.
Siphonanthus triphylla Hiern MSS. (*Clerodendron triphyllum* Harv.). No. 717.

LABIATÆ.

Ocimum hians Benth, Nos. 710, 1277.
Orthosiphon Pretoriæ Gürke. No. 877.

Plectranthus fruticosus L'Hérit. No. 1158.
Æolanthus sericeus Gürke. Nos. 1239, 1240.
Pycnostachys reticulata Benth. var. *angustifolia*. Nos. 1238, 1291.
Micromeria biflora Benth. No. 881.
Salvia runcinata Linn. fil. No. 1017.
Leonotis malacophylla Gürke. No. 878. By an oversight this was given (*ante*, p. 194) as *Leonotis Leonurus*.
Teucrium capense Thunb. No. 971.
Ajuga Ophrydis Burch. No. 970.

Note on Senecio cordifolius Linn. fil.

This plant was first described in Linn. fil. Suppl. p. 372, the type being a specimen from Sparmann. The eighteenth century specimens in the British Museum of what is certainly this, for they agree in every way with the type in Linnæus's herbarium, were collected by Masson & Nelson. The sheet containing these has been written up "*Senecio cordifolius* Linn. Suppl.," and later, "*Cineraria cordifolia*." When L'Héritier studied these plants for his *Sertum Anglicum*, he decided to remove *S. cordifolius* to *Cineraria*, and there being then already in vogue a *Cineraria cordifolia* (=*Senecio alpinus* Scop.), he shortly redescribed *S. cordifolius* as *Cineraria mitellæfolia* (Sert. Angl. p. 25). This latter name Solander did not enter upon the Museum sheet, the reason being, in all probability, that L'Héritier intended publishing the plant as *Cineraria cordifolia*, and did not discover his oversight until after returning to Paris.

Retained in *Senecio* by De Candolle and by Harvey, this plant is nevertheless a true *Cineraria*, having the extremely flattened achenes characteristic of that genus. It should therefore be known in future as *Cineraria mitellæfolia* L'Hérit.

SHORT NOTES.

Deyeuxia neglecta Kunth, Rev. Gram. 76 (1829) in Caithness.—Under the name *Arundo stricta* the above plant was first added to the British flora by George Don from the White Mire, near Forfar, in 1807, but with the so-called reclamation of the marsh the plant was shortly after extirpated. Subsequently it was found in the swampy margin of Oakmere, Cheshire, by the Rev. G. E. Smith, about the year 1847, where it is still plentiful. A closely-allied species, the *Calamagrostis lapponica* Hook. (non Hartm.) or variety, had also been discovered by the marshy shores of Lough Neagh, Ireland, by David Moore in 1836. In the year 1888 I had the good fortane to discover in Perthshire, near the shores of Loch Tay, another closely-allied plant, the *Deyeuxia borealis*, or *Calamagrostis borealis* Laestad. in Fl. Torn. p. 44 (1860), which I placed as a variety of *D. neglecta* (see *Scottish Naturalist*, 1888, 350). Shortly after, the marsh in which it grew, which was of very limited extent, was filled up with sawdust from the neighbouring saw-mills, which had been erected soon after to saw up the trees which the

great gale of the early nineties had blown down, so as to completely eradicate the plant, which thus again was lost to the Scottish flora. When I was at Thurso in 1902 I visited the locality described in the *Life of Robert Dick* where he gathered what he thought was *C. lapponica*, a plant which more recently has been referred to *Calamagrostis* or *Deyeuxia strigosa* Kunth, Gram. 77 (1829), which was said to have been gathered at Loch Duran by Robert Dick, and recorded by Mr. Arthur Bennett in this Journal for 1885, p. 253, as *C. strigosa* Hartm. Loch Duran has itself been drained since Dick's time, but *D. strigosa* was found there by Mr. Grant about 1885, and subsequently by Mr. F. J. Hanbury and other botanists. Mr. Hanbury also found it more plentifully in another locality in the county. Unfortunately when I was at Thurso, I had no Caithness specimen by me, nor did I know the exact locality where it had been gathered. I, however, made a careful examination of the Ordnance map, and with the Rev. H. J. Riddelsdell set out in quest of this interesting species. It was a wet day, and the marsh was not pleasant walking, but before we had been in it five minutes I saw *Deyeuxia* growing as at Loch Tay over a very limited area of only a few square yards. As the grass in the vicinity was being mowed, I carefully cut some fifty specimens, and felt very elated about adding this local species to my collection. I remarked at the time that I did not see how to separate it from *D. borealis* as a species; and on my return home and comparing it with Scandinavian specimens of *D. strigosa*, I felt very doubtful whether my plants were identical with it. I therefore sent it to Professor Hackel, who at once replied that it was *D. neglecta* and not *D. strigosa*. Although in some way disappointing, it was pleasant to rediscover one of Don's plants, especially as it was thus restored to the Scottish flora. I meant to have gone up this year in order to see whether *D. strigosa* also grows there, and as favouring this view I may say that, after a very careful description of the localities where the Rev. E. S. Marshall and Mr. F. J. Hanbury collected their specimens of *D. strigosa*, I am convinced that mine is not identical with these, although in the immediate vicinity. Professor Hackel, however, doubts if true *D. strigosa* has been found in Scotland. A specimen given me by Mr. Hanbury closely resembles my specimen from Scandinavia of *D. strigosa*, but as yet my eyes have not allowed me to dissect the spikelet for microscopic comparison. It would be especially interesting to find that Caithness possesses both species.—G. Claridge Druce.

Lolium temulentum L.—In his *Flora of Dorsetshire* (ed. 2, 1895) the late Mr. J. C. Mansel-Pleydell gives *L. temulentum* L., "first record, Bell Salter, 1830"; adding that Bell Salter records no locality, and that the Dorset name is "Cheat"; but, though the plant is "rare," there are no stations. It has seemed curious how a rare plant, for which no localities could be produced, should have a local name. Till this summer I, too, had never met with the species in the South of England; but last August the beardless variety (var. *arvense* With.) occurred among rye at Edmondsham. The tenant farmer informed me he had the seed of the crop from

Sixpenny Handley, a few miles away. Another villager knew of a sort of rye-grass by the name of "Cheat," which was often in rye-fields. There, owing to the similarity of the grains, it is likely to find sanctuary; but its increasing scarceness among other cereals is a testimony to the superiority of modern machinery for winnowing and sifting. *L. temulentum* is easy to detect if looked for *horizontally*; but the much inclined spike, with its edge upwards, is almost invisible from a vertical direction.—E. F. Linton.

Glyceria (Panicularia) distans Wahl. var. tenuifolia Gren. & Godr. in Sussex and Kent.—This plant was first named *Aira brigantiaca* by Chaix in Villars' *Plantes Dauph.* i. 378 (1786), without a description, Chaix having discovered it at Briançon. Villars, in his second volume, p. 81 (1787), gave a long description of the same plant, but changed the name to *Aira miliacea*: "Aira foliis glabris striatis, flosculis ternis obtusis distinctis, panicula numerosissima. b. *Airæ aquaticæ* Flor. Delph. 6." He says, "Cette espèce rare n'a été cueillie qu'aux forts de Briançon, où elle se trouve abondamment." He changed the specific name from *brigantiaca* to *miliacea*, from the resemblance of the spikelets to those of *Milium effusum*. Grenier and Godron (Fl. France, iii. p. 356 (1855-6)) place it as a variety *tenuifolia* of *Glyceria distans* Wahl., characterized by "epillets de moitié plus petits, à 3–4 fleurs." I first noticed this plant some years ago, growing in a muddy tidal ditch near Shoreham in Sussex, and in 1902 the same plant attracted my attention in the mud-flats at New Romney, Kent, where it grew in some quantity with nearly typical *G. distans*, *G. Borreri*, &c. Professor Hackel kindly identified it as the above variety, which has not been previously recorded as British. Richter (Pl. Europeæ) places it as *Atropis distans* Ledeb. Fl. Ross. iv. p. 388 (1853) var. *brigantiaca* (Chaix).—G. Claridge Druce.

Arrhenatherum avenaceum Beauv. var. biaristatum in Kent.—This plant is described by Petermann (Fl. Lips. 106, 1838) as follows:—"*A. biaristatum* Peterm.: Culmis nodis subpubescentibus; panicula elongata subcontracta; flos masculus et hermaphroditus geniculato-aristati, aristis longe exsertis. Flos masculus ad basin geniculato-aristatus, arista valde tortili, hermaphroditus ad apicem geniculato-aristatus, arista (ubi ad alteriorem ejus sedem non respicitur) aristam floris masculi subæquante." Richter (Pl. Europ. p. 65) reduces Petermann's species to a variety—as *A. elatius* Mert. & Koch. var. *biaristatum*—and gives Germany as its habitat. This is the plant described in this Journal for 1902, p. 351, as being the first to appear on the shingle deposits which are so conspicuous a feature between Dungeness and New Romney. Professor Hackel has named it as above. It has not been hitherto recorded as British.—G. Claridge Druce.

Senecio palustris DC. in Sussex.—In recently going through the correspondence and herbarium of Dillenius for the purpose of publishing a brief biography and an account of the herbarium, which has many interesting species, I came across a letter of Dr. Littleton Brown, who accompanied Dillenius on the well-known

expedition into Wales, and who was himself a keen and accomplished botanist. In the letter, written in 1726, he mentions, in addition to many other interesting records, that he had gathered "174–3. Conyza foliis laciniatis in ye watry ditches upon ye east side of ye wild Brooks near Amberly, Sussex." The specimen of *S. palustris* representing this number in the Dillenian herbarium is unfortunately unlocalized, so that we have no confirmatory evidence there. I need not say that the locality is eminently suited for the plant, and the recent discovery of *Peucedanum palustre* in East Sussex by Mr. Hilton and myself encourages one to hope that this rarity may even yet be found in that county. The plants which Dr. Littleton Brown collected are usually correctly identified by him, and he was also a diligent student of the Cryptogams. Dillenius made a separate copy of the *Senecio* record, but in this, "west" is probably inadvertently written instead of "east." — G. Claridge Druce.

Thlaspi silvestre in Radnorshire.—In September, 1900, I had an hour or two on the Stanner Rocks, Radnorshire, and picked up one or two specimens of a crucifer which I did not recognize, but which the Rev. E. F. Linton has kindly named for me. It is *Thlaspi alpestre* var. *silvestre* (Jord.). There was a very small quantity of it, and I could not see any (though I must admit that my search was cursory) in July of this year, when I revisited the spot. If it is native, and anything more than a chance bird-sown individual, how can it have been passed over by the many botanists who know the Stanner Rocks? It occurs, according to Dillwyn, about Pontneddfechan and Aberpergam, in the Vale of Neath; *i.e.* certainly in Glamorgan, and probably also in Brecon county. Dillwyn does not say which of the two forms occurs, but the plant of the Stanner Rocks makes *silvestre* more probable. There is a great likelihood that search will reveal it in other parts of these S. Wales counties. Mr. Arthur Bennett informs me that the plant of Caernarvon and Denbigh is *T. occitanum*, *T. silvestre* being known only from Durham, Northumberland, Forfar, and West Perth. — H. J. Riddelsdell.

NOTICES OF BOOKS.

Flora of Derbyshire: Flowering Plants, Higher Cryptogams, Mosses and Hepatics, Characeæ. By William Richardson Linton. With two maps. 8vo, cloth, pp. 457. Price 12s. 6d. London: Bemrose & Sons.

Mr. Linton says that "the present work cannot be regarded as much more than a stage forward towards a complete account of the botany" of Derbyshire. This is assuredly too modest: the only previous attempt at a Flora has been Mr. Painter's "Contribution," published in 1889, the manifest deficiencies of which were pointed out by Mr. Bagnall in this Journal for that year (pp. 318–320). Mr. Linton has given us the result of ten years' work, during which "nearly every parish has been visited and searched either by the

author or by helpers co-operating with him"; and he has made himself acquainted with the bibliography of the subject, of which he gives a full account, arranged chronologically "as a record of botanical investigation in the county." He has based his botanical divisions "upon the surface geology of the county so far as practicable": this, of course, is scientific, but a glance at the geological map shows its practical inconvenience; the millstone grit, for example, runs through the county from north to south, and crops out elsewhere, and the map does not indicate the differences between G 1 and G 2, into which it is divided, while "the northern division, it must be admitted, includes a considerable extent of other formations than grit." The divisions adopted are Mountain Limestone (L.), Millstone Grit (G., with two subdivisions), Coal Measures (C.), Permian (P.), Trias (T., with three subdivisions); these are described, and their special flora indicated, in the introductory chapter on "Soils and Species"; other chapters on "Climate and Species" and "County Rainfall" (the latter by Dr. H. R. Mill, Director of the British Rainfall Organization), with a very interesting summary, showing the constitution of the Flora according to Watson's "types of distribution," complete the introductory matter.

A proper anxiety to bring the material within moderate compass is doubtless responsible for a certain dryness which seems to characterize the work. We have more than once protested against the inclusion in local floras of matters only remotely connected with the subject, but Mr. Linton seems to us to err in the opposite direction. We miss such notes upon the plants themselves as those which render Briggs's *Flora of Plymouth* of more than local value; and we think the historical side of the Flora should have been more fully treated—*e. g.* the localities and notes of the earlier writers might have been quoted textually. For example, under "*Cochlearia alpina* H. C. Wats." we read "First record, Parkinson, 1640"; but we are nowhere told whence Parkinson recorded it. His note, however, is of sufficient interest for transcription: "I heare also that it groweth nigh unto a Castle in the Peake of Darbishire, which is 30 miles distant at the least from the Sea, and that the late Earle of Rutland, and divers other personages of good note, had some brought from thence for their owne use" (p. 286). Parkinson of course considered the plant to be *C. officinalis*, and it is under that name that Stokes records it in the second edition of Withering's *Arrangement* (ii. 678) from "Castleton, Derbyshire, on the side of the hill on which the Castle stands"—perhaps the same as Parkinson's locality, but seemingly not quite identical with any of those given by Mr. Linton.

One item of special interest is the creation of a new species of *Epipactis*—*E. atroviridis*—accompanied by a weird illustration which is certainly unlike any *Epipactis* we have ever seen. Mr. Arthur Bennett, in our next issue, discusses this at some length, and we must refer our readers to his remarks. We think, however, that a local flora is not a suitable medium for the publication of novelties; the general systematist can hardly be expected to hunt

through such works on the chance of a new species being published therein.

The worst feature in the book is to be found in its abbreviations, and in the difficulty of ascertaining their meaning. On the first page of the preface we read of "the authorities employed in C. D."; we search the list of "abbreviations" in vain for an explanation, and it is only after hunting through thirteen pages of the bibliography that we learn that "C. D." = Mr. Painter's *Contribution* to the Flora. The inconvenience of this is accentuated in the body of the work by the fact that no dates are given, and, as the abbreviations are often the reverse of obvious, their interpretation may involve a chase through sixteen pages of references. "B. and N., J. B.," hardly conveys to the uninitiated the paper in this Journal for 1883 by Messrs. Baker & Newbould; "Rowland, C. D." means that Mr. Rowland recorded the plant in Mr. Painter's *Contribution* —a work which seems to have suggested to some extent Mr. Linton's method of abbreviation; "The Naturalist," without any date, may refer, as we learn from the bibliography, to any volume between 1880 and 1895. All these we take from the account of *Tanacetum vulgare*, where many more may be found; those who wish to check Mr. Linton's references will not thank him for the many and serious obstacles he has placed in their way. Nor can it be said that the exigencies of space have demanded such economy in citation; in the great majority of cases the lines would easily take more words, and some of the citations—e. g. "*The* Naturalist"—might be further abridged without detriment.

Mr. Linton regrets the omission of the fungi, lichens, and algæ from the work; but he may claim credit for the very full treatment of the mosses and hepatics, which together occupy more than a hundred pages. It is a pity that he has given them a separate index; one index is all that is necessary for a book like this, and, indeed, for most books.

We are sorry not to find the British Museum Herbarium among those quoted; it could hardly fail to supply matter of interest, but Mr. Linton may fairly plead his residence in the county in excuse of this omission. Anyway, he has given us a very comprehensive list of Derbyshire plants, and has thus filled up another of the rapidly disappearing gaps in the tale of our county floras.

Nomenclaturæ Botanicæ Codex brevis maturus sensu Codicis emendati aux Lois de la Nomenclature Botanique de Paris de 1867 linguis internationalibus: Anglica, Gallica, Germanica quoad Nomina Latina auctore Otto Kuntze. 4to, pp. lxiv. Stuttgart: Deutsche Verlags-Anstalt. 1903.

This small work would require a longer notice than our space will allow us to give, were it to be dealt with adequately. It evinces a thorough knowledge of the subject, and is full of information and suggestion, extending in many cases to points of detail which however minute are never unimportant. So far as the Codex itself is concerned, we find ourselves mainly in accord with Dr. Kuntze's

suggestions. We note that he still maintains 1737 as the starting-point for genera, and, while still thinking that on many grounds 1753 is preferable, as being the base from which complete nomenclature proceeds, we must admit that there is much to be said in favour of the earlier date.

We regret, however, that Dr. Kuntze, in his "commentaries" on the Codex, should have given way to the extraordinarily offensive language which has done so much to mar the effect of his work, and, however illogically, to prejudice folk against his conclusions. We are at one with him in objecting to the arbitrary Berlin rules, especially that which establishes the fifty-years limit; but it cannot be necessary to call them "swindle-rules," or to speak of them as "perfidious and stupid." The Americans "who maintain the inexecutable Rochester resolutions" are "a botanical Tammany-ring"; but his most offensive attack is upon Dr. Levier, for which his strangely worded explanation is no justification: "In the combats that myself as the principal defender of the Paris Code had to fight since ten years against the widely spread corruption in botany, I met not rarely with such malefactors; their just and strong designation was only duty. That such designations occur several times is no wonder and nevermind a disculpation for a single malefactor."

With regard to the "Kew rule," Dr. Kuntze rightly points out that it consists of two principles, and that these are mutually contradictory. We have always maintained that the citation of Bentham & Hooker for numerous names which they never made is contrary to correct practice, and can only be considered as a concession to sentiment: but this does not justify the charge of "servility" against the author of the *Index Kewensis*, nor make the inconsistency "a shame for the Royal Kew Herbarium"! He is, however, we think, on firm ground in taking exception to the names first published in the *Hand-List* for the Kew Arboretum, issued without author's name and including numerous additions to nomenclature: "such anonymous excesses should in future no more be encouraged by quotation." Unfortunately, it would seem that Messrs. Durand & Jackson intend to include them in the Supplement to the *Index Kewensis*: we agree with Dr. Kuntze that it would be better to ignore them, as was done by Mr. Jackson with the Gandogerian names, which have comparatively strong claims to insertion.

Apart, however, from the defects of style, which cannot be overlooked or, we think, palliated, Dr. Kuntze has made a valuable contribution to the literature of nomenclature, and no Congress for the discussion of the subject can be considered satisfactory or representative which ignores his claims to be present at its deliberations.

Botany of the Færöes, based upon Danish Investigations. Part II. 8vo, pp. 339–681. 2 plates, 100 figures in text. Copenhagen: Bojesen.

The second part of this well-printed and well-illustrated work is mainly devoted to the Marine Algæ, which have been very carefully elaborated by F. Börgesen; it contains also contributions by E.

Östrup on the Diatoms from these Algæ, by C. H. Ostenfeld on the Phytoplankton from the sea, and a joint paper by Messrs. Börgesen and Ostenfeld on that from the lakes; H. Dahlstedt describes the Hieracia, and Prof. Warming, the general editor, has an essay on the history of the Flora. This last is of especial interest to British botanists, and entirely supports the view—first promulgated, we believe, by Dr. Trimen and Mr. Newbould—that the Færöes would (apart from political considerations) be rightly included in the British Flora, just as the Channel Islands should be excluded therefrom. Prof. Warming's essay is too long to reproduce, even in part, and we must refer our readers to the book itself, which by the way is written in English; he analyses the contributions of the various authors with regard to the groups they have elaborated, and comes to the conclusion that, "taking everything into consideration, the whole of the flora—at least all the more highly organized land-plants—have [*sic*] immigrated after the glacial period across the sea, and to the nearest countries lying east, especially Great Britain." Elsewhere he says: "Even on the basis of his very poor material, N. Wille in 1897 (Botaniska Notiser) arrives at the conclusion that the flora should more particularly be characterized as a poorer part of the English flora, and that the forms agree very closely with those of England."

Prof. Warming says the flora, "seen from a geological point of view," is "a young flora," having no endemic species of vascular plants except"—the exception is significant—"among the Hieracia." These were entrusted to Dahlstedt for elaboration, and it will surprise no one who is acquainted with his published fasciculi—of new subspecies and new varieties of subspecies and new forms and new hybrids and "modifications"—to learn that "the 23 forms (21 species and 2 varieties) are all endemic, though they are often closely related to forms in the surrounding countries." They are described at very great length, and no brief diagnoses are given. The rest of the new forms are: "Mosses, 1 species and some 7 varieties out of 338 species; Freshwater Algæ, 4 species, 3 varieties, and a few secondary forms out of 324 species; Freshwater Diatoms, 4 species and some 9 varieties out of 248 species; Fungi, 9 species out of 168 species; Lichens, no new forms out of 194 species."

We note that a third part, containing "the papers on the vegetation of land and sea," is in preparation, it having been found impossible to conclude the work in two parts, as had been intended; this "will most likely be ready for publication in a year or two." The various contributions forming the present volume have been "published" separately—the first containing the Marine Algæ as long ago as November, 1902; a fact which must not be overlooked in the citation of new names.

It is to be regretted that in a work of this kind some use should not be made of the tops of the pages, which might well indicate the subjects treated of below, instead of, as at present, containing nothing but the number of the page.

Vegetationsbilder. Edited by Dr. G. KARSTEN and Dr. H. SCHENCK. Parts III. to V. 4to. tt. 13–30 with text. Jena: Fischer. 1903. Subscription price 2 M. 50 Pf. each part; single parts 4 Marks.

THE excellent character of the earlier parts (noticed on p. 110) is maintained in the three parts of the "Plant-pictures" now before us. The third, for which Dr. Schenck is responsible, is entitled "Tropical Economic Plants," and includes photos of a Java tea-plantation, a tree of *Theobroma Cacao* in ripe fruit, habit and flower and fruit of *Coffea liberica*, a fruiting branch of *Myristica fragrans*, and a tree of *Carica Papaya*. The plates in part 4, by Dr. Karsten, depict the luxuriant vegetation of the tropical and subtropical Mexican forests. The subjects are apparently well chosen, and give an excellent idea of the rank growth in a damp tropical forest, and a vivid picture of the fierce struggle for existence which has for its result the occupation of every available place and the elaboration of the climbing and epiphyte type of plant-life.

Part 5, by Dr. A. Schenck, illustrates a very different kind of vegetation, that of the hot dry region in South-west Africa, where is the home of *Welwitschia*, a photo of which is the subject of plate 25. It is not beautiful, but, like the giant Sumatran *Rafflesia*, it is a thing which one would much like to have discovered. This part also includes what seems a good figure of *Aloë dichotoma*, and also pictures of *Acacia*, *Euphorbia*, and other characteristic hot, dry country types of vegetation.

The *Vegetationsbilder* should be of interest to the botanist, and also a great help to him who has to teach the science. If we cannot see these things ourselves, the next best is to have access to a well-chosen and well-executed series of plates.

A. B. R.

BOOK-NOTES, NEWS, &c.

M. ÉMILE GADECEAU publishes, in Mém. Soc. Nat. Hist. Cherbourg, xxxiii. [Cherbourg, 1903], pp. 177–368, an important essay on *Belle-ile-en-mer; Géographie Botanique*. Belle-ile is an island, eleven miles long by three and a half broad, off the mouth of the Loire, and forms a favourite steamboat excursion from Nantes. The island is a wind-swept plateau, 100–150 feet above sea-level, of non-fossiliferous schists, with a narrow coastal margin; the numerous narrow valleys opening on the coast occupy but a small fraction of its area. The plateau, which a few hundred years ago was a forest, is now treeless, largely in cultivation, with areas of furze and heath interspersed. M. Gadeceau's essay deserves the attention of botanists in general for its conclusions regarding the distribution of species; and it merits the special attention of British botanists on account of the close parallelism between Belle-ile and considerable areas in Cornwall—the plants and even the varieties of Belle-ile recurring in Cornwall. There grow in Belle-ile *Ulex Gallii*, *Erica ciliaris*, and *E. vagans*, *Adiantum Capillus-Veneris*,

Hypericum linarifolium, &c. The chief difference between Cornwall and Belle-ile is that the latter is slightly warmer. Belle-ile is the northern or western limit of several remarkable species, e.g. *Tolpis umbellata*, *Omphalodes littoralis*, *Plantago subulata*, *Trixago Apula*. M. Gadeceau has been able to collect on Belle-ile during many seasons, and at various seasons of the year. He gives at the end of his essay his "Conclusions Générales." The more general of these may be summarized: (1) Climate exercises an altogether preponderating influence on the distribution of species; (2) Next in importance is the distribution of moisture, and of the rains, and the persistence and strength of the winds (which increase the transpiration of plants); (3) The physical characters of the soil, which have much more effect than its chemical composition. In the systematic list M. Gadeceau deals fully with many critical forms or subspecies of South-west England—such as *Ulex Gallii* Planchon, *Daucus Carota* Linn. (*α maritima* DC. and *δ gummifera* Lam.), *Linaria Elatine* Miller, *Carex punctata* Gaudin, and *C. distans* Auctt. Anglicorum.

Mr. J. Cosmo Melvill is presenting his large herbarium, estimated to contain about 40,000 species, to the Museum of the Owens College, Manchester. Mr. Melvill is for the present retaining the cryptogams, grasses, and British plants. A detailed account of the herbarium is being prepared for the next annual report of the Museum.

Dr. W. G. Smith and Mr. W. M. Rankin publish in the *Geographical Journal* for April and August an important paper on the Geographical Distribution of Vegetation in Yorkshire, of which we have received a reprint. It carries into England the work accomplished by the late Robert Smith (brother of one of the authors) for Scotland, and contains a thorough investigation of the Leeds and Halifax district and the Harrowgate and Skipton district, on a scale of two inches to the mile, and comprises about one hundred and fifteen square miles. The mapping is shown in four divisions:—1. Moorland: pure types, with six subdivisions. 2. Moorland: transition types, with four subdivisions. 3. Woodland: with three subdivisions. 4. Farmland: with three subdivisions, varied in Part 2 by one more in woodland, and one less in farmland. On these maps we are enabled to see at a glance the range of uncultivated (using this word in its widest sense) land, with the dominant species. In the letterpress, reproductions of photographs are given of the aspect of this varied vegetation, *e. g.* "On a Cotton Grass Moor," "The Undergrowth of an Open Oak Wood," "The effect of Beech on the Undergrowth," "Undergrowth of a Pine Wood," and many other interesting views. As this excellent work goes on, many other results will gradually evolve, and a comparison with other work of a similar character—such as that of E. A. Wainio in Finnish Lapland, that of Norman in his *Norges Arktiske Flora*, 1894, 1895, and others—and the large amount of work of this character now being carried on in America, will be possible. It is to be hoped all British botanists will be able to procure this reprint and will study it. The excellent cartography

deserves a word of praise; we are now able to produce maps that will well compare with many continental productions.

The "5th Circular of the Permanent Committee of the International Congress of Botany" contains information, as well as selections from preceding circulars, with reference to the Congress proposed to be held in Vienna in 1905. "The translation from French into German and English has been made with the assent of the Paris Committee through the Vienna Committee." It is to be regretted that, so far as the English is concerned, it was not submitted to someone acquainted with the language; as it stands, it is a delightful example of "English as she is spoke," or written. We are told that the results of the Congress of 1900 "will prove that in the debate, amply opened through its care and exertions, the same never wished to express its own opinion anyhow, confined continually to its task being purely an administrative one just as defined by the Congress"; and the circular concludes with this touching appeal: "The aim pursued with all loyalty will surely be attained, if you will succeed in combining some proposals susceptible to convey an intelligence, and then leaving the remaining under discussion till to the time when their necessity will appear more obvious." It appears to us that that time has already arrived.

The receipt of the Nineteenth Annual Report of the Watson Botanical Exchange Club suggests to us once more the desirability of a union between this and the Botanical Exchange Club. It seems to us that this would result in a gain to both organizations, in a great saving of labour to the referees, and of trouble and expense to those who are members of both. The united club would also probably obtain a sounder financial basis. This is of course a mere suggestion, and could only be carried out with the cordial co-operation of the officers of each Club; but we feel convinced that the combination would be attended with advantage to science as well as to the individual members. The Report before us contains, as usual, many interesting notes, some of which we may reprint in a future number. Mr. H. W. Pugsley is the distributor for 1902–3.

Mr. J. M. Wood, of the Natal Botanic Gardens, is continuing his useful publication on *Natal Plants*. We have lately received the first part of vol. iv., containing twenty-five plates of various flowering plants, and the third part of the volume (ii.) devoted to Grasses. The figures, especially in the former, seem to us to show a considerable advance on some of the earlier illustrations. We still think it might be possible to select plants of greater botanical interest; but the primary object of the publication is of course to promote local knowledge and information, and from that point of view the selection is doubtless excellent. We note, however, one species—*Kalanchoe longiflora* Schlechter MSS.—which is apparently here published for the first time; this might have been made clearer by the addition of "sp. n." to the name. It would also be a help if a list of the contents of each part were printed on the cover.

We are glad to learn that our valued contributor, Mr. W. G. Smith, has been elected President of the British Mycological Society.

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For Classified Articles, see—County Records; Obituary; Reviews. New genera, species, and varieties published in this volume, as well as new names, are distinguished by an asterisk.

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CORRIGENDA.

P. 58, ll. 9 & 11 from top, for "centim." read "mm."
P. 176, l. 18 from bottom, for "or" read "on."
P. 194, bottom line, for "*Leonurus*" read "*malacophylla*."
P. 195, l. 17 from bottom, for "*Barberiæ* Harv." read "*spectabilis* Schlecht."
P. 293, top line, Eddlesborough is in Bucks.
P. 314, l. 5 from bottom, for "'Hachel" read "Hackel."
P. 373, l. 14 from bottom, for "acquired by Horniman Museum" read "in possession of his daughter"; l. 17, for "July" read "Feb."
P. 360, l. 12 from top, for "Butr." read "Beitr."
P. 378, l. 6 from top, delete "1840"; l. 8, after "Garden" add "1840."

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